The Monthly Review of the AMERICAN ELECTROPLATERS' SOCIETY

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OCTOBER 1940

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The MONTHLY REVIEW

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Editorial

I have just read with much interest the article by Dr. C. B. F. Young entitled, "A Course of Study for the Electroplater," in the August REVIEW. Having had the experience of working out a curriculum for platers, not foreman platers, and also having had contact with platers for an extended period, it is my opinion that the course indicated by Dr. Young is entirely too scientific. As described, the course implies the possession of a certain amount of knowledge and educational background on the part of the student. I do not believe the average plater possesses the background necessary to derive full benefit from such a course. I concede that there are foremen platers who would profit from the course. However, it seems to me that the course suffers from the ailment of too much emphasis on chemical and electrochemical theory and insufficient electroplating practice. In my opinion, the function of the plater and foreman plater is production, while technical control should be in the hands of the plant laboratory. Hence, a course of study for the electroplater should stress good electroplating practice and not attempt to make an electrochemist out of the plater. From a chemical standpoint, the course should cover the simpler electrochemical definitions such as throwing power, current density, current efficiency, and analysis of plating solutions. I can see no need for more chemistry than this in a

course for platers; no need, for example, for a knowledge of the methods and theory of making up standard solutions for use in analysis. On the other hand, the course should attempt to summarize electroplating practice. Metal cleaning, cleaning sequences for various metals and alloys, principles of racking, plating equipment, and drying methods are some of the subjects that should be covered. Also the plating of various metals should be covered, stressing the factors that affect the quality and quantity of deposit in each case. Specification plating of the various metals should be covered. Barrel and automatic plating are important subjects. Proprietary processes and methods should be included. Recent developments should be mentioned, at least. The course should have as its primary function the summarizing of and the placing into concise and concrete form those plating principles with which many platers are now familiar only as individual cases or problems or solutions to problems. I fail to see the necessity of a knowledge of the periodic law, fixation of nitrogen, phase rule, etc. My experience with platers would indicate that a course similar to the one outlined by Dr. Young would be received with impatience and disinterest because a large part of it is not practical. From actual teaching experience, I have found that platers are disinterested at a lecture covering, for example, conductivity, current efficiency and Faraday's Laws. They feel that this information will not benefit them. However, a lecture on cadmium plating, which summarizes the various scraps of information they may have and in addition describes the field in its entirety, will create intense interest. In closing this discussion, I would like to make it clear that I am referring to the average plater, and not to men whom I could name and whom we all know, or to the modern type of enlightened foreman plater. I have in mind men that begin as rackers or helpers and slowly reach the status of plater, without however acquiring more than a casual knowledge of what they are doing. It is my experience that practically all platers are of this classification. These men do not need courses in chemistry and electrochemistry. They need instruction in electroplating, a summarizing of their trade and its principles.

A. MANKOWICH

Magnesium *as a* Control Agent *for* Zinc Anodes

By R. O. HULL
E. I. du Pont de Nemours & Co.,
Cleveland, Ohio

Presented before Dayton Branch Annual Meeting, June, 1940

ONE of the principal problems in the operation of any cyanide zinc plating bath is maintenance of solution composition with respect to zinc metal. This is particularly true of the bright zinc plating baths that are now widely used, since these invariably require close control of all components. Maintenance of cyanide zinc solutions with respect to sodium cyanide and caustic soda is quite simple, as these constituents can be determined by analyses and added in exact amounts. Control of zinc metal in cyanide solutions is relatively difficult, however, because of the fact that zinc anodes are dissolved chemically by the highly alkaline plating baths as well as electrochemically, which with a variable cathode efficiency usually results in a rapid, sometimes almost uncontrollable rise in zinc concentration. For cyanide zinc plating in which gray or white deposits are desired, the problem has been partially solved by the use of zinc anodes containing mercury[1], aluminum[2], or mercury and aluminum[3]. Mercury-zinc anodes have a definite value in promoting white deposits and lessening solution attack on anodes, and aluminum-zinc anodes are effective in diminishing anode sludge. The application of these anodes to bright plating baths is objectionable either because of introduction of heavy metals which interfere with the brightness of deposits or because of accumulation of zinc resulting from the high anode efficiency of 97% to 105% as compared with the average cathode efficiency of 85% to 95%.

The most common procedure for controlling zinc metal content of bright zinc baths is to use from 25% to 50% inert, insoluble steel sheet with the zinc anodes. Although some measure of control is possible by this means, a serious complication arises from electrical contact of the zinc and iron in the alkaline solution, giving an electrolytic couple and resulting in as much as a tenfold increase in the normal rate of solution or corrosion of the zinc. Under such conditions, the zinc concentration falls when the solution is worked and rises when the solution is idle, some-

times changing as rapidly as one ounce per gallon per day, and hence this means of control is generally unsatisfactory.

The predominant factor in the observed high rate of zinc build-up in bright zinc solutions is the difference between anode and cathode efficiencies rather than chemical attack of anodes, provided no accelerating metal is in electrical contact with the zinc. For this reason, a study was undertaken to develop a means for controlling anode efficiency to equalize it with the average cathode efficiency and to provide a means for metal content control similar to that of the other common plating systems. The approach to the problem was paradoxical in that instead of increasing efficiency, the usual object of electroplating research, our object was to decrease anode efficiency.

PRINCIPLE

The principle utilized in the present method for controlling zinc anode efficiency is believed to be unique in electroplating and consists of adding a small amount of magnesium or calcium as a secondary metal during the process of manufacture of zinc anodes. Both of the secondary metals are highly reactive and form compounds of low solubility in cyanide solutions.[4] In the plating bath the secondary metal dissolves and precipitates as an insoluble compound, presumably hydroxide or carbonate, forming a thin gelatinous coating over the anodes.

This coating exercises a two-fold effect on anode behavior.

First, it reduces the rate of anode solution, or anode current efficiency, by an amount proportional to the content of secondary metal in the anode, since this factor controls the thickness of film built up on the anode. The insoluble film might be expected to continue to build up until ultimately no current could pass through the film. However, experience indicates that the film apparently assumes a definite maximum thickness, depending upon the secondary metal content, following which the anode efficiency remains constant.

The second effect of the coating of insoluble magnesium or calcium compound formed continuously is that it unites mechanically with loose sludge from the anodes and carries it to the bottom of the plating tank where it obviously cannot interfere with the deposits. Hence, baths using anodes containing magnesium

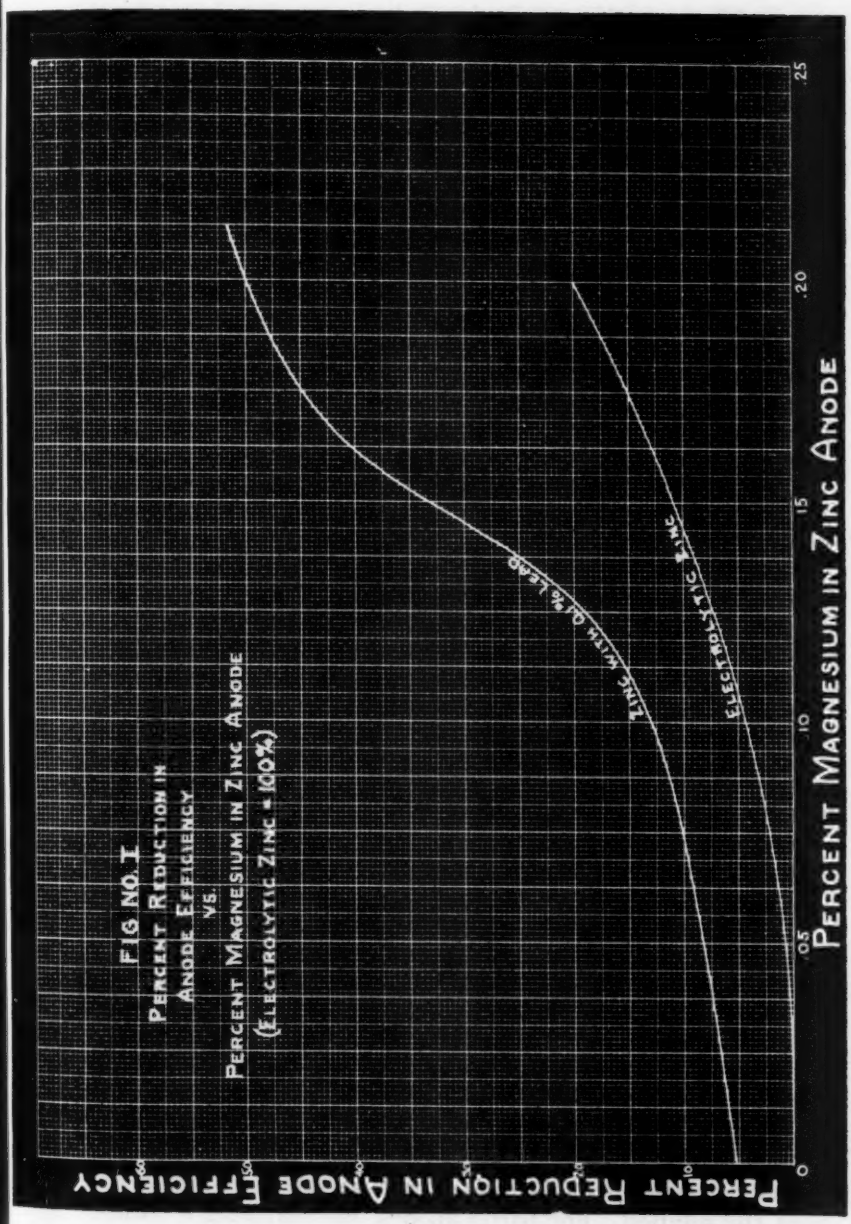
FIG. NO. I
PERCENT REDUCTION IN ANODE EFFICIENCY VS. PERCENT MAGNESIUM IN ZINC ANODE (ELECTROLYTIC ZINC = 100%)
PERCENT REDUCTION IN ANODE EFFICIENCY
PERCENT MAGNESIUM IN ZINC ANODE
ELECTROLYTIC ZINC WITH 0.7% LEAD
ELECTROLYTIC ZINC
0
.05
10
15
.20
25
50
80
90
100

Fig. 1

or calcium are characterized by relative freedom from objectionable anode sludge floating about in the solution.

Ideally, the anode efficiency in any plating system should exceed slightly the cathode efficiency by an amount equivalent to the normal dragout rate. Zinc plating is somewhat different in that the anode efficiency should equal the average cathode efficiency, since chemical attack of the anodes usually suffices to replace metal lost by dragout. As stated before, the average cathode efficiency in bright zinc plating varies from 85% to 95%, and hence efforts were made to develop an anode which would have an average anode efficiency of about 85%.

After determining that the addition of magnesium to zinc is effective in controlling anode efficiency, it was expected that increasing the percentage of magnesium would result in decreasing the anode efficiency, or in other words, increasing the effective reduction of anode efficiency. Another result that would perhaps be expected is that the effect of magnesium in reducing anode efficiency would be different for different types or purity of zinc metal. Both of these are illustrated in Figure 1, giving the percentage reduction of anode efficiency (assuming electrolytic zinc 100%) versus percentage of magnesium in the zinc metal for electrolytic zinc and for commercial zinc containing 0.1% lead. From this it is apparent that zinc containing lead has a normal anode efficiency about 5% lower than the pure zinc and hence requires a somewhat smaller amount of magnesium for the same reduction in efficiency. The amount of magnesium normally added to high purity zinc is 0.18%, which reduces the anode efficiency from 100% to about 84%, whereas 0.11% magnesium is sufficient for zinc containing 0.1% of lead. An interesting fact is that only 0.20% magnesium reduces the anode efficiency of electrolytic zinc to 80% and of zinc containing 0.1% lead to 50% —far lower than has heretofore been possible by any other known practical method.

It is apparent that the anode efficiency should depend to considerable extent upon the current density that is used in plating. This is substantiated in that the application of zinc anodes containing 0.18% magnesium for barrel plating (in which anode current densities are high) results in a rapid falling off in zinc content of the solution. For barrel anodes, the magnesium addition is about 0.05% which experience has shown is quite satisfactory

for maintaining the zinc content, provided the anodes are not in contact with steel and are completely insulated from the sides of the metal tank.

As was mentioned above, calcium can be used instead of magnesium for reduction of anode efficiency, although considerably larger additions are necessary for the same degree of reduction. Thus for the reduction in efficiency to about 88%, 1% of calcium is required to be added to electrolytic zinc metal as compared with 0.16% of magnesium.

The effect of calcium and magnesium in reduction of sludge formation is illustrated in Figure 2 showing the sludge from zinc solutions in which electrolytic zinc anodes have been used containing no added metal and similar anodes containing calcium and magnesium, respectively. When these solutions are thorough-

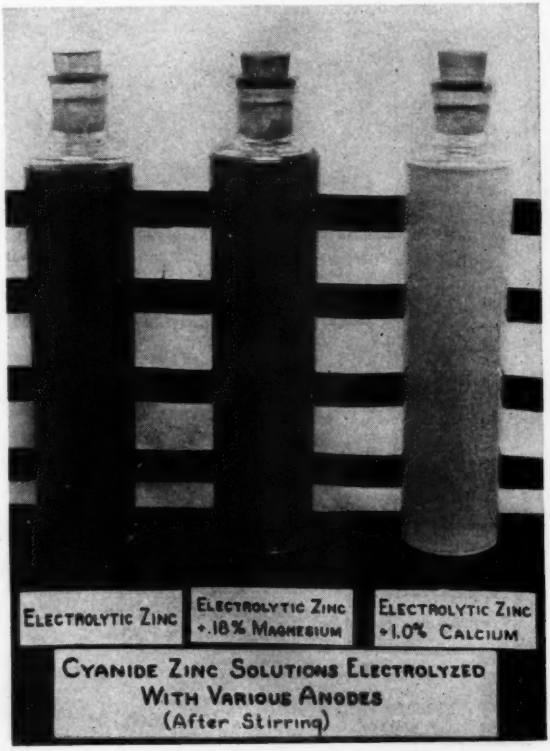
ELECTROLYTIC ZINC
ELECTROLYTIC ZINC +.18% MAGNESIUM
ELECTROLYTIC ZINC +1.0% CALCIUM
CYANIDE ZINC SOLUTIONS ELECTROLYZED WITH VARIOUS ANODES (After Stirring)

Fig. 2

ly shaken, the anode sludge from calcium or magnesium alloy anodes settles in a few minutes, whereas the sludge from the electrolytic anode settles only after several hours and is greater in amount, as shown in Figure 3.

An extension of the use of magnesium in zinc is to anodes containing other alloy elements such as mercury or aluminum. Thus when magnesium is added to a mercury-zinc anode, even though such anodes are not the best to use for bright zinc plating, the alloys obtained offer the same degree of stability in operation as anodes in the other plating solutions such as copper or cadmium. Such anodes are resistant not only to attack by solutions but offer the advantage of controlled rate of solution or anode efficiency when the solution is worked. Although additional magnesium or calcium to anodes does not influence the rate of chemi-

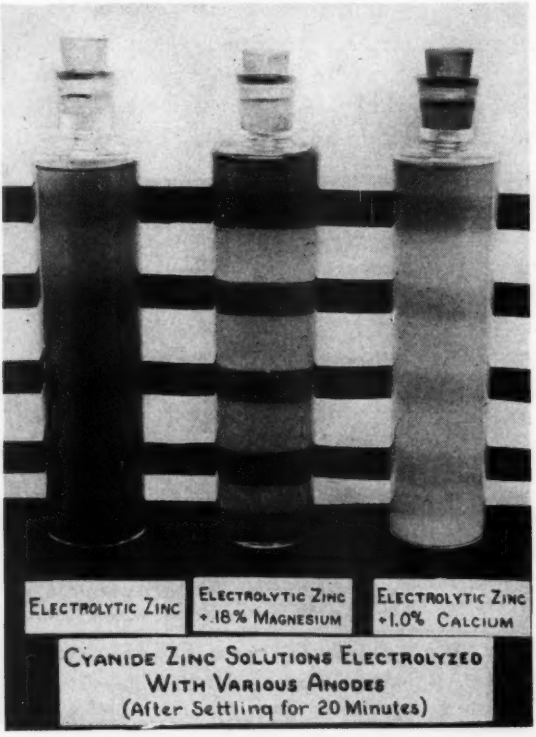
ELECTROLYTIC ZINC
ELECTROLYTIC ZINC +.18% MAGNESIUM
ELECTROLYTIC ZINC +1.0% CALCIUM
CYANIDE ZINC SOLUTIONS ELECTROLYZED WITH VARIOUS ANODES
(After Settling for 20 Minutes)

Fig 3.

cal attack of anodes when the bath is idle, it nevertheless is of marked indirect benefit in that their use eliminates any necessity for using auxiliary anodes other than zinc that do influence the rate of chemical or electrochemical attack.

In bright zinc plating it is not only desirable but quite essential to maintain the zinc metal within narrow concentration limits, if bright deposits over the usual current density ranges are to be obtained at reasonably high cathode efficiency. Magnesium-zinc alloy anodes for accomplishing this have been used extensively in commercial baths and have proved almost indispensable in the reasonable exercise of solution control for their operation and maintenance.

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[1]U. S. Patent 1,435,875.
[2]U. S. Patent 1,888,202.
[3]U. S. Patent 1,887,841.
[4]Patents pending.

HOGABOOM AND STEVENS AT MEETING

George B. Hogaboom, electroplating engineer and Irving A. Gemmel, New York Sales representative of the Hanson-Van Winkle-Munning Co., manufacturers of electroplating equipment and supplies, attended the meeting of the National Stereotypers and Electrotypers Association, Sept. 18-20, at the Hotel Roosevelt. Mr. Hogaboom addressed one of the sessions of this convention on the subject of Nickel Plating.

DETROIT BRANCH EDUCATIONAL PROGRAM

November 1, 1940
Mr. John C. Bogle, Udylite Corp. "The Place of Rectifiers in Electroplating."
Movie, "More Than Meets the Eye."
December 7, Saturday 2:00 P. M.
Dr. C. F. Kettering, General Motors Research Laboratories.
Subject to be announced.
Dr. F. A. Rohrman, Michigan College of Mining and Technology. "Vagaries of Corrosion Testing."
Mr. F. F. Oplinger, E. I. duPont de Nemours & Co. — "Copper Plating."
January 3, 1941
Mr. P. W. Soderberg, J. B. Ford Co. — "Some Factors Affecting Detergency with Particular Reference to the Cleaning of Metals Prior to Electroplating."
February 7, 1941
Mr. E. A. Anderson, New Jersey Zinc Co., Mr. M. R. Caldwell, W. B. Jarvis Co. — "Electroplating of Die Castings."
March 7, 1941
Mr. R. M. Wagner, Guide Lamp Division, G. M. C. — Subject to be announced.
April 4, 1941
Dr. Charles L. Faust, Batelle Memorial Institute. — Subject to be announced.
May 2, 1941
Dr. William Blum, Bureau of Standards. — Subject to be announced.

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Corrosion Testing *of* Electrodeposited Metal

By N. J. GEBERT

Metalurgist-York Plants,
American Chain Co., Inc., York, Pa.

Reprinted from Souvenir Yearbook,
Philadelphia Branch, November, 1929

SINCE the beginning of time, men have struggled to provide suitable standards for measuring the quality of their efforts along all lines of endeavor. Until recent years, the standards of measurement of quality were handed down by traditions of operator to operator. The demands of the purchaser for improved and better plating has led to earnest endeavor in research deaprtments all over the country, to determine some accurate methods of measurement which can be duplicated and recorded for future references. This line of thinking has led up to the present methods, through what now seems to be crude and unsatisfactory devices. Probably the first and most widely used test was the atmospheric test, which simply consisted of exposing the surfaces to be tested to weather conditions. In the light of present high production conditions in our industry, it is not hard to see the inadequacy of this method, to say nothing of the unsuitability of the results. The improvement of this method by the use of a wick and water container only served to shorten the time of test, but left the results just as uncertain of duplication. The next step was the spraying of super-heated steam upon the work until the failure resulted. These now obsolete devices led to the present-day methods for testing the resistance to corrosion of electrodeposited metals upon a ferrous base, such as the salt spray, Preece test, hydrogen evolution, basic lead acetate, ferroxyl, etc.

In selecting a test method, consideration must be given to the type of metal plated, and whether slight imperfections of plating retard or accelerate corrosion of the ferrous base at the defect. For instance, a method for determining pin holes in zinc plates is not as important as thickness of plate. The protective value of the zinc depends upon the fact that zinc has a greater "solution pressure" or tendency to dissolve than does iron, and in the presence of moisture, zinc in contact with iron, forms a gal-

vanic cell, the zinc being the anode and the iron the cathode. Therefore, the presence of zinc will prevent iron from dissolving or corroding in a small exposed area, such as a pin hole, unless the area is large enough for the center of the hole or scratch to be too far away from the protection. The salt spray, I believe, was originally devised for the testing of zinc coating, and it is very useful, due to the fact that the salt solution dissolves the zinc at a measurable rate, and primarily measures thickness of plate. A test conducted showed the following:

Wt. zinc oz. per sq. ft.	Hours to failure
.17	95
.22	113
.34	232
.39	255
.59	300
.76	336

Accelerated corrosion tests of zinc coating (such as the Preece Test) have received extended attention and research, inasmuch as zinc was one of the first metals used as a protective coating for steel.

Due to the fact that nickel, copper and chromium are being extensively used for exterior decorative purposes, we have conducted sufficient research in testing, that we feel that the balance of this paper can be devoted to the consideration of these electro-deposited metals. Our efforts in this direction have led to the point where we feel we have reduced the testing and inspecting to a mathematical formula for quality.

Since nickel, copper and chromium have a lower "solution pressure" than iron (that is, are below iron in the electro-chemical series), coatings of these metals protect iron and steel from corrosion if, and only if, they are impervious. Any conclusive test for porosity should, therefore, indicate the relative protective value of these coatings.

The salt spray has been used extensively for this and the fact that rust appears initially after different periods, and increases in extent upon some plates more rapidly than others, probably

corresponds to differences in the number, size and shape of the pin holes in the deposit. Since nickel, copper, and chromium suffer no appreciable loss in weight in the salt spray, the time required for a plate of nickel or copper to rust is, in reality, the time required for the salt solution to penetrate to the bottom of the pin hole, and then for the products of corrosion to rise to the plated surface. It is, therefore, necessary to define the conditions of failure, and the first appearance of rust is not a good criterion of the value of the plating. E. M. Baker describes a failure as rust that would be "plainly discernible at a distance of three or four feet." Blum in his tests on the protective values of nickel plating was not able to get better than a 30 percent variation in results. E. M. Baker writes "that a variation of from 60 to 140 hours in the salt spray for a plant produced product would represent reasonably good control of that plating process."

There are many disadvantages to the use of the salt spray for routine production testing. The two (2) major objections even if using standard equipment as outlined in Bureau of Standards circular No. 80, being uncertainty of the end point (which is quite a matter of personal judgment) and length of time required to test a good plate. At the present time one of our Bumper plants is operating under a Customer's specification of 50 hours salt spray minimum. For plant control, I believe you will readily agree that this measure of testing is out of the question, taking more than two (2) days for completion, considering that this plant has a capacity of more than 10,000 pieces per day, and we would not know until Thursday whether Monday's work was O. K.

We doubt whether the hours to failure of work tested in the salt spray will be the same between any two (2) commercial plants. Irregularities occurring due to variations in equipment and operating methods, such as fineness of spray, temperature of solution, method of exposing the work (upside down, on edge, etc.), force of air pressure and particles of foreign matter (dust, oil, etc.) carried in by the air. Another cause for misjudging failure is the fact that not only the surface to be tested is sprayed, but the whole article is subject to corrosion, thereby causing sections not requiring a heavy plate to corrode quickly and the rust spread over the entire article. The ferroxyl test was developed for the

detection of porosity, and is so used. We have for more than two (2) years used a slight modification of the solution as published by Blum and Thomas of the Bureau, which gives us reliable and accurate information in two (2) minutes. The Blum and Thomas formula is:

10 grs. Agar
1 gr. Potassium ferri-cyanide
10 grs. Sodium chloride
1000 c. c. Distilled water

For routine inspection (which is made every two [2] hours by an inspector) it is more convenient to spray the bars rather than dip, and, therefore, the various reagents have been changed to a solution of the following composition:

15 grs. Agar
6 grs. Potassium ferri-cyanide
60 grs. Sodium chloride
1000 c. c. Distilled water
250 c. c. Alcohol

This solution is kept in a small bottle, which is maintained at approx. 120 degrees F., by keeping it in a larger dish of water, on a small electric hot plate. A syphon is attached to the bottle and an oxygen tank with a gauge for control is used to blow the solution on the work. Compressed air cannot be used, due to the liability of its carrying dust, which may contain some iron. This particle of dust may be deposited on the surface under test, causing a blue spot and give an inaccurate result. Inspection is made by a certain number of blue spots appearing in two (2) minutes on the length of the Bumper bar. If any bar shows more then the stipulated number of blue spots, the plater and laboratory are immediately notified, so that corrective measures can be applied at once. This gives the plater an opportunity of keeping a close check on his solutions and aids in the detecting of over buffing before the trouble has gone so far as to cause excessive rejections, with a consequent tie-up of production.

Contrast more than two (2) days in the salt spray with this two (2) minute test. We have checked the accuracy of this method in comparison with the salt spray and in more than fifty (50 tests)

we have not had any case where a bar passed the ferroxyl test and then failed in the salt spray, or vice versa. If the surface examined has not failed under the ferroxyl test, after removal of the testing reagent with water, the article can be passed for shipment. This is, therefore, a non-destructive test, and can be reduced to mathematical accuracy, that is, so many spots per square foot per unit time.

A blue spot shows a pin hole to the steel, while a brown spot shows a hole to the copper. Of course, it is imperative that the bar be thoroughly cleaned before applying the corroding solution. In testing the nickel-plated bar, the pores of the nickel are filled with grease from the buffing operation, and if not removed, the apparent protective value will be increased. In actual service, the presence of this grease may be of value, but in testing, the surface must be clean in order to get reproducible results. Cleaning in an electrolytic cleaner is the best method that we have been able to find to date. However, we test the Bumper bars after chromium plating, and since we do not buff the chromium, this cleaning operation is not necessary, which saves quite a lot of time. If the chromium plate is buffed, it is necessary to use a cleaner such as carbon-tetra-chloride, since chromium is soluble in the usual electric alkaline cleaners.

When a permanent record is desired, a considerably stronger solution is sprayed on paper and the paper dried in an oven. This method has been described in detail by Karl Pitschner—A. S. T. M. 1927. Patent has been granted for this paper method, but the paper is marketed by one of the large chemical supply houses. The paper is moistened with water, and the sensitized side put on the dry work, and after removal (in about three [3] minutes) all the reagent can be washed out of the paper, leaving only the blue spots indicating pin holes to the the steel, and brown spots indicating pin holes through to the copper.

An extensive investigation is being undertaken by our Research Department to try to tie up a little closer the results from salt spray and ferroxyl testing. This is quite a problem, as the work cannot be tested first by the ferroxyl test and the same bar put in the salt spray, since it has been shown that a bar ferroxyl tested and showing some pin holes, will show rust in the salt spray al-

most immediately at these pin holes. The cause of this has not been definitely proven, but it is the writer's opinion that the corrosive agent has so thoroughly cleaned the bottom and sides of the pin holes, that it is subject to instant corrosion in the salt spray. It, therefore, looks as though it will be necessary to locate the pin holes by the microscope before proceeding with a comparative test. However, as explained above, we do know that if only a few small spots appear in the ferroxyl test, the work will withstand the specifications of the automobile industry, which are probably as strict as any on the market today.

I wish to acknowledge the assistance rendered in preparing this paper by Mr. Delano, Plants Engineer, and Mr. Rohrbaugh, Chemist of the York Plants, and that given by the Research Department.

HANSON-VAN WINKLE-MUNNING COMPANY EXHIBIT

The Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies will exhibit a miniature corronizing line in the booths of the Standard Steel Spring Company, X7-X17 at the National Metal Show, Cleveland, Ohio. October 21-25.

THE LEA OUTING AT BETHLEHEM, CONN.

The annual fall outing of the Electroplaters was held at Leacrest, on Saturday, September 8, 1940. There was an attendance of 211, which is by far the biggest crowd at one of these events, the largest previous attendance being 180 odd. The usual events took place, namely, archery, quoits, shooting and the various indoor sports such as bowling, etc. Bob has a new bowling alley about 12 feet long which is a knock-out.

First prize on the Trap-Shooting was won by Gray Somers of the Somers Brass Company, Waterbury, who did a very creditable job in shooting a perfect score and tying with T. W. McIntyre of the French Manufacturing Company. Score: 10 out of a possible 10. In the shoot-off, Gray won with a 9 out of 10 to cop the prize.

We believe the distance prize was won by D. F. Mosher of Cleveland, Ohio, our midwestern representative, and the runner-up for the distance prize was either Joe Downs from Elmira or Don Wood from Taunton, we haven't looked up our geography to see which is farther away. Our October 11 meeting at which Norman Prince of Scobell Company is going to talk will be well worth attending.

Polishing, Buffing *and* Plating Zinc Base Die Castings

By T. C. EICHSTAEDT
Detroit Branch

THIS subject is a large one and of considerable importance, not only for the automobile industry, but in practically all manufacturing where metals are the principal materials used for making a wide range of hardware, novelties, electric light fixtures, and ornaments of every kind. Zinc base die castings are better made now than ever before; moreover the problem of polishing, buffing, and plating is much less than some time back—and not so very far back either.

I will herewith mention a few of the problems found in plating zinc base die castings in the early stages of their use as ornamentation, especially in the automobile industry. Much thanks is due to the American Electroplaters' Society for its assistance to the plating industry. Its members cooperated in the dissemination of knowledge on this problem for years, and even at this present time there is hardly a meeting where some question regarding the polishing, buffing, and plating of die castings does not come up and, in the discussion following, there is not some very important fact, entirely new, presented.

For a long time before there were specifications for electroplating die castings, and before chromium plating came into practical use, almost anything was tried in order to get the die casting plated. Some used a copper strike, some a brass strike and some a special nickel solution for striking, followed by another nickel solution for building up the nickel deposit, but rarely ever was it possible to run a solution for very long without its becoming contaminated with zinc and making it necessary to precipitate the zinc and throw it away. Most of the time, in fact, the whole nickel solution was thrown away and a new one made. I now have in mind a large manufacturing plant which, having made up a ten-thousand-gallon nickel solution, was obliged to throw it down the sewer after a very short run and have a new one made to replace

it, on account of the time and labor and the uncertain results of precipitating the zinc and separating it from the nickel solution.

There was also the uncertainty of the nickel holding up for any length of time, and where a copper or brass strike was used the zinc in the casting would not absorb the copper, leaving only a shell of nickel over the casting. This would adhere to the casting and could be peeled off. In other words, there was no protecting coat of nickel at all. But, now, the same people who at that time wanted die castings nickel plated, without any copper or zinc strike, are the most persistent in demanding a certain copper deposit upon the die castings before nickel plating, as it has been proved that, if the copper deposit is heavy enough, it will not be entirely absorbed by the die casting. Even though it is not entirely absorbed, a certain amount of it is absorbed on account of the electrolytic action and the affinity of the zinc for the copper. It is claimed that the nickel is a better protection for the casting if at least five ten-thousandths of copper deposit is under the same amount of nickel or even a better protection of five-thousandths deposit of copper be under a five-thousandths deposit of nickel.

With all of the new patented copper and nickel solutions now on the market, it is possible to get almost any amount of copper deposit (which does not need buffing before nickel plating, as it is a bright copper) and at a given time and at a given amount of current density per square foot. The amount can be calculated to be almost sure after it has once been tested and the solution is maintained at a given temperature and all the ingredients kept constantly the same.

These solutions are a boon to the electroplating industry, and by using this high-speed bright-copper solution for die castings, all that is necessary to insure a real nickel deposit is to rinse the casting in cold water, a muriatic or sulphuric acid of 10% or 15%, and again in cold water; then plate in a rapid bright-nickel solution for a given length of time with a solution that is kept at a constant balance of temperature, current density and ingredients. One can almost be sure that a certain amount of nickel is deposited upon the article; and if it is to be chrome plated, it can be rinsed, in cold water. The spray type of cold water rinse is the best to use here—in fact, in all operations where a thorough rinse is necessary—and then the article can be chrome plated.

With the temperature, mixture of solution, and current density held constantly at a certain standard which has been determined by study and testing, one can now turn out a pretty good chromium-plated die casting to almost any specifications demanded. But it is the writer's contention that zinc base die castings are not and never will be electroplated so as to give the durability of a real good brass or bronze forging, and considering the expense necessary in preparing die castings for electroplating, it is not good economy. Die castings are a make-shift and false economy in any place where a finished electroplated article must be both ornamental and long wearing.

Polishing and buffing of zinc base die castings have been simplified quite a bit since better standards of mixture have been set and better dies and machines developed. They need very little polishing, the fins only need removing and a good buffing. The fins are generally cut off with a die. But there is a parting line which is usually not removed by this die or shear, and it cannot be entirely buffed away. It must therefore be polished off, and on some articles of intricate shape it costs more to remove this than to buff the whole article. Then again where this parting is on a surface which is designed to be flat, it is quite an operation. Sometimes it is necessary to use a #60 abrasive to make this surface flat, and a polishing wheel which will not soften enough to make the surface rounding, and yet the wheel must not be so hard as not to give some, just the little resiliency which is necessary. Either a #180 or #200 abrasive is needed for the next or second polishing operation. In both the first and second operations an abundance of grease should be applied to the wheel to keep the casting from overheating and the wheel from filling up with zinc. Occasionally the wheel must be cleaned with lump pumice, followed by an abundant application of grease.

Some platers seem to think there is not much to polishing and buffing die castings, but the writer has been connected with the finishing of die castings for years and finds very few polishers or buffers who understand polishing them. The pressure, length of time, speed of wheels, size of wheels, and the kind of wheels are all very important factors in efficient polishing and buffing of zinc base die castings.

There is very much more that can be said or written on this subject, but in conclusion I will just touch on a not altogether

new method of preparing some zinc base die castings for electroplating, using neither a polishing nor buffing operation, nor a tumbling barrel method. It is a stamping process—a sort of squashing operation where the die casting with the sprue as it comes from the die casting mold (after cooling awhile) is placed in the stamping machine. This has a die made to fit the casting, and the sprue is cut off and the casting is squashed to size and at the same time a smooth surface put on it. Then it is rocked and plated in the bright copper solution following the same procedure as mentioned before in nickel and chrome plating, and the castings which are finished by this process compare very well with some that are polished and buffed before electroplating. So far as durability of the deposit is concerned, it will wear longer and be just as good protection and ornamentation as any that is polished and buffed and nickel colored. No buffing is of course required, and thus all possibility of peeling near the cut edges is eliminated.

NEWS ITEM

E. L. McIlhenny, Sales Manager, Alkali Division, Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Michigan, manufacturers of a complete line of Industrial Alkali Cleaning Compounds, Emulsion Cleaners and Strippers, and Metal Parts Washers, has announced the appointment of two sales and service supervisors in the Midwest as follows:

W. S. Fernholz, with headquarters at the Chicago Office, will supervise the states of Illinois, Missouri, Wisconsin, Iowa, North Dakota, and South Dakota; L. Camel, with headquarters at the Cleveland Office, will supervise the states of Ohio, Kentucky, West Virginia, Western Pennsylvania, and Western New York.

TYPE "A" BIAS BUFFS

The Bias Buff & Wheel Company, 430 Communipaw Avenue, Jersey City, N. J., announces a type of buff that has been specially designed to reduce high polishing costs in the buffing and finishing departments.

Increased polishing surface, and the elimination of waste in both cloth and polishing compounds, together with the exceptionally good constructive features are points which the company emphasizes in their description of this special buff.

This buff is known as Type "A" and is well adapted for all classes of work. Cloth from which Bias Buffs are made is produced in the company's own cotton mills; and it is claimed that this cloth is unequalled for durability and long wearing qualities.

The Bias Buff & Wheel Company makes a complete line of guaranteed ventilated buffs for use where high speeds are necessary in certain kinds of buffing and finishing.

Placing a Plating Contract*

Guessing bidders and loose specifications result in a queer collection of figures

By ADOLPH BREGMAN
New York Branch

SOME time ago a certain State Commission found itself with a good sized lot of miscelleaneous plumbing fixtures and hardware which needed replating, due to wear, tear and other natural causes. This commission compiled a list of the fixtures and sent out a request for estimates to a considerable number of electroplaters in its vicinity. In due time, the sealed bids were received and opened, and they read as shown in Table I.

In order more clearly to illustrate this "divergence of ideas," Table II lists the bids of platers A, E and K, item by item.

At the first glance this aggregation of estimates, guesses, or what have you, would stagger any statistician. The party placing the work might even be tempted to toss them all into the waste basket and start afresh. However, an analysis of these bids discloses enough reasons for the variation in prices to teach an object lesson in "What is wrong with American Industry?"

Note first of all, that bids A, B and C are all in the "low bracket"; D, E, F, G, H and I are grouped quite closely together in the middle range; J and K are high, and L is astronomical.

Why? Were six platers out of 12 crazy? Many manufacturers would say unhesitatingly—yes! But that is hardly the whole truth.

It is instructive, therefore, to look at the specifications, as quoted below:

"All wrench and hammer marks or other scars to be ground smooth. All existing chromium plating to be removed. All foreign substances to be removed with acid solution baths. All parts and pipes to be copperized before plating and receive one heavy coat of nickel and one heavy coat of chromium, and be buffed smooth before each plating and polished after chromium plating.

*From the Iron Age, July 4, 1940.

"Work to be guaranteed for two years against stripping, and to withstand exposure to sea and shore atmosphere.

The first sentence is clear; it means that the plater must grind out all existing imperfections. The amount of work involved depends entirely upon the condition of the parts and this can be checked only by a good inspection before estimating. "All existing chromium plating to be removed," means stripping; and the same applies to the "removal of foreign substances with acid solution baths."

But note the next sentence which calls for a "heavy" coat of nickel and a "heavy" coat of chromium.

What is a "heavy" coat of nickel?

What is a "heavy" coat of chromium?

And there lies the most important reason for the spread of estimates. A "heavy" coat of nickel on brass may be anywhere from 0.0003 in. to 0.001 in. or over. To be sure, there are a variety of specifications for nickel and chromium on brass and steel parts, giving various thicknesses—*but they do give thicknesses*. The word "heavy" means almost anything—or nothing.

Also, why call for "buffing smooth before each plating?" There are now available many bright nickel plating solutions, which, if not alone, then certainly with a light fanning operation after the chromium, give a finish fully equal to the buffed copper, buffed nickel and polished chromium.

Now to the next sentence, requiring a guarantee of two years against stripping, and withstanding exposure to sea and shore atmosphere. Guarantee of electroplating in the consumers' hands is a very risky procedure. Many of these parts are exposed to storms and sharp changes of weather. Many are in washrooms and lavatories. Many of them are constantly handled by millions of people. The fixtures are in the care of unskilled labor and their cleaning and polishing may be neglected. Since the life of a plated part depends to a considerable extent upon the care with which it is handled, and the conditions of its abuse and use are completely beyond the control of the plater, a guarantee for two years or five years, or even three months, lays the plater open to unforeseeable damages.

Add to this the fact that the rejection of defective work may even allow the commission to have it re-plated and billed to the original plater, and it becomes obvious why some bids were so high. It undoubtedly accounts for bids J and K of $777.85 and $887.14 respectively. These platers noted carefully the two-year guarantee and determined to do a job that would stand up under almost any imaginable conditions. The bid of plater L of $1,557.96 can be explained only on the ground that he was unfamiliar with this class of work, that he noted the two-year guarantee and decided to put in a figure that was bomb-proof.

Bids A, B and C also require explanation. Bid A of $298.94, the writer learned privately, was made in virtual ignorance of the job. The estimator did not see the work; it was described to him by an associate, who brought back only a verbal report, omitting many essential details, and with complete disregard of the two-year clause. This plater figured on doing a job which would pass muster in the cheaper class of apartment houses where no guarantees are asked for or given, and where, if the plating wears out quickly, the tenant either does not complain, or if he does, the parts are given another cheap plate.

Bids B and C of $380.44 and $414 were also made on the basis of cheap work, but with a better knowledge of the work involved. It is probable that these bids minimized the amount of grinding necessary to remove wrench marks and other scars.

When the bids were opened, naturally "A" got the job. After a study of the other bids he wisely turned it down. Obviously, if he had taken it, he would have "lost his shirt," either in bringing the job up to specification or in liability for having to do it over. Bidders B and C at $388.20 and $414 respectively would "get away with it" if they were lucky. But they, according to the writer's information, took this risk with their eyes open. Although this is not the best practice, in these piping times it is very often done "to keep the shop busy."

This leaves the six platers D to I inclusive, who bid from $470.11 to $528.81. It is most enlightening that at least one of these bidders (F, at $496.35) had done work for the same commission in former years. In other words, he knew what he was about.

Table I—Competitive Bids for a Plating Job

A	$298.94
B	388.20
C	414.00
D	494.85
E	488.27
F	496.35
G	496.40
H	531.45
I	528.81
J	777.85
K	887.14
L	1557.96

Table II—Itemized Bids for the Same Plating Job

	Item	Plater A Unit Price	Total	Plater E Unit Price	Total	Plater K Unit Price	Tota
56	flanges	3c	$1.68	8c	$4.48	10c	$5.60
216	flushometer valves and angle valves	50c	108.00	93c	200.88	$1.75	378.00
120	shower heads and ball joints	25c	30.00	40c	48.00	75c	90.00
500	feet ½-in. brass pipe	7c	35.00	8c	40.00	10c	50.00
350	feet ¾-in. brass pipe	6c	21.00	9½c	33.25	12c	42.00
164	wall flanges, ¾-in.	4c	6.56	6c	9.84	10c	16.40
4	extended body faucets	25c	1.00	22c	.88	75c	3.00
200	½-in. brass bolts	1c	2.00	1½c	3.00	10c	20.00
72	½-in. elbows	5c	3.60	8c	5.76	12c	8.64
10	soap dispensers, pump type	10c	1.00	30c	3.00	75c	7.50
8	combination faucets and angle valves	35c	2.80	$1.32	10.54	$2.00	16.00
1	mixing valve and angle valve	$4.00	4.00	60c	.60	$2.00	2.00
2	1½-in. spray heads	50c	1.00	25c	.50	50c	1.00
64	pieces 9-in tubing 1½-in., and 64 bell escutcheons	15c	9.60	17c	$10.88	50c	32.00
7	basin faucets, complete	15c	1.05	35c	2.45	50c	3.50
5	electric plates	8c	0.40	15c	.75	25c	1.25
1	cabinet part	$2.00	2.00	20c	.20	$2.50	2.50
14	bottle fillers and goosenecks	50c	7.00	88c	12.32	$1.75	24.50
28	Halsey Taylor bubblers	20c	5.60	44c	12.32	$1.75	49.00
28	handles & bonnets	20c	5.60	30c	8.40	35c	9.80
20	bubblers	10c	2.00	22c	4.40	$1.00	20.00
20	strainers	10c	2.00	13c	2.60	20c	4.00
20	cross tee handles	15c	3.00	20c	4.00	15c	3.00
20	bonnets—China bowl parts	10c	2.00	35c	7.00	75c	15.00
20	handles cross tee	10c	2.00	20c	4.00	15c	3.00
40	bonnets	10c	4.00	20c	8.00	20c	8.00
40	flanges	5c	2.00	10c	8.00	12c	4.80
4	flange hooks for rope	15c	.60	30c	1.20	35c	1.40
17	push plates, 3½x14 in.	25c	4.25	21c	3.54	75c	12.75
8	kick plates, 8½x30 in.	$1.50	12.00	$1.46	8.48	$2.00	16.00
6	thumb bolts and flanges	10c	.60	10c	.60	15c	.90
8	handles for doors	15c	1.20	55c	4.40	25c	2.00
96	hatch hole covers, 6-in. port holes	15c	14.40	25c	24.00	35c	33.60
			$298.94		$488.27		$887.14

Any attempt to organize this clearly chaotic condition must take into consideration all of the following points:

(1) If a contract must go to the lowest bidder and if, as always happens, one or more bidders estimate blindly, foolishly, or take chances, it is certain that the successful bidder will lose money or that the work will be badly done.

(2) If specifications are loose, vague, and indefinite, the bids will vary from alpha to omega—even if the bidders are all careful, sound and experienced estimators (which never happens).

Perfection in placing and performing contracts is, of course, as impossible as perfection in any other field of endeavor. Mistakes may be made by even the best, let alone the next best, the tenth best and the worst, who are always bidding on some job or other. But the first, the most important and the most thoroughly practical and easily instituted preventive of trouble is *proper specifications*. Of these there is no longer any lack. There are available Federal specifications and recommendations of the National Bureau of Standards. Certainly, from one of these guides, sufficient information could have been extracted to have set proper standards for this job.

It is hoped that in the future, for jobs of this character, specifications will be set that will be a guide to the bidder and a protection to the purchaser in search of "a good plating job."

AVAILABLE SPEAKERS FOR BRANCH MEETINGS

W. A. Helbig, Darco Corp., 60 E. 42nd St., New York, N. Y. *Activated Carbon Plating Solution*

G. J. Berry, F. K. Rouge, Electric Products Co., 1725 Clarkstone Rd., Cleveland, Ohio. *Motor Generator Maintenance, Design, and Application.*

C. F. Mesle, Oneida Ltd., Oneida, N. Y. *Current Distribution, Adhesion, Thickness, Testing.*

Leroy Sullivan, Devine Brothers, 102 Whitesboro St., Utica, N. Y. *Polishing and Buffing.*

C. E. Berger, G. B. Hogaboom, R. C. Case, V. Mattacotti, M. B. Diggin, Hanson Van Winkle Munning Co., Matawan, N. J. *General Finishing Subjects.*

B. F. Lewis, North West Chemical Co., 6531 Russell St., Detroit, Mich., *Electro-Cleaning.*

C. B. Young, Box 292, Flushing, L. I., N. Y. *Gold Plating or Related Subjects.*

Hiram S. Lukens, University of Pa.

Edwin M. Baker, Ann Arbor, Michigan.

E. H. Bucy, G. R. Watkins, Zapon-Brevolite Division of Atlas Powder, Stamford, Conn. *Industrial Finishes.*

Harold Leever, W. L. Cassell, MacDermid Inc., Waterbury, Conn., *Cleaning and Plating Developments.*

R. M. Shields, Duriron Company, Dayton, Ohio., *Equipment.*

Dr. William Stericker, Philadelphia Quartz Co., Philadelphia, Pa. *Metal Cleaning.*

T. K. Cleveland, Philadelphia Quartz Co., Berkeley, Cal. *Metal Cleaning.*

A. B. Wilson, C. F. Nixon, W. M. Phillips, General Motors Corp.

E. A. Anderson, New Jersey Zinc Co., Palmerton, Pa. *Finishing and Plating Die Castings.*

E. C. Rinker, Oakite Products, Inc., 22 Thames Street, New York, N. Y. *Metal Cleaning.*

W. F. Newberry, D. E. Williard, W. A. Vensel, Detroit Rex Products Co., Detroit, Mich. *Degreasing.*

L. D. Dunn, E. L. McIlhenny, Detroit Rex Products Co., Detroit, Mich. *Alkali Cleaning.*

John F. Harper, Jackson Buff Corp., Long Island City, N. Y. *Automatic Buffing.*

John C. Bogle, The Udylite Corp., 1651 E. Grand Blvd., Detroit, Mich. *Rectifiers and their Place in the Electroplating Industry.*

Derick S. Hartshorn, Jr., The Enthone Company, 440 Elm Street, New Haven Conn. *Wetting Agents and their Application to the Plating Industry.*

R. E. Pettit, Aluminum Co. of America, New Kensington, Pa. *Alcoa Aluminum and its Finishes.*

F. F. Oplinger, E. I. duPont De Nemours Co., Wilmington, Delaware. *The Plating and Heating of Zinc Base Die Castings.*

R. O. Hull, duPont Company, Electroplating Division, Graselli Experimental Lab. Cleveland, Ohio. *Magnesium as a Control Agent for Zinc Anodes.*

W. J. Schneider, duPont Company, Electroplating Division, Empire State Bldg., New York, N. Y.

R. H. McCahan, duPont Company, Electroplating Division, Empire State Bldg., New York, N. Y.

E. C. Friedl, duPont Company, Electroplating Division, Guardian Bldg., Clev land, Ohio.

H. L. Benner, du Pont Company, Electroplating Division, Guardian Bldg., Cleveland, Ohio.

H. W. Kennedy, duPont Company, Electroplating Division, 1530 E. Hancock Street, Detroit, Mich.

H. I. Hansen duPont Company, Electroplating Division, 230 East Ohio Street, Chicago, Ill.

C. J. Wernlund, duPont Company, Electroplating Division, R & H Chemicals Dept., Niagara Falls, N. Y.

CHARLES C. CONLEY
Chairman, Educational Committee

Here and There

YOUNG LADY INTERVIEWS WENDELL WILLKIE

Miss Janet Elwin, daughter of Mr. and Mrs Tennant Elwin had the privilege of interviewing the Republican candidate for the presidency during his visit to Waterbury on Wednesday, October 9. Mr. Willkie told the high school reporter that he occasionally reads Latin for a pastime.

Miss Elwin is on the staff of *The Argus*, the high school publication. Her father is an active member of Waterbury Branch A. E. S. and is employed by the Scovil Manufacturing Company. He was formerly president of the Waterbury and Hartford-Connecticut Valley branches.

HARTFORD BRANCH

Hartford Branch held its regular meeting on Monday evening, October 21, at the laboratory of the Underwood Elliot Fisher Company. Through the fine work of the branch officers in advertising the meeting, there was an attendance of over 100. Members of other branches were present from New Haven, Bridgeport, Springfield, and Waterbury. Visitors from cities and towns in the vicinity of Hartford attended in goodly numbers. Outstanding in the success of the meeting was Mr. Kenneth Billinger of the Chemical Corporation, librarian of Hartford Branch. For weeks Ken has devoted all his spare time to make this event one to be remembered.

After visiting the splendidly equipped lab there was a round-table discussion otherwise known as an "information please" hour. Those having charge were John Costigan, president, Springfield Branch; Henry Smith, R. Wallace & Sons, Wallingford, Conn.; Ralph Colter, Chromium Corporation of America, Waterbury; J. H. Donahue, The Abbott Ball Co., Hartford, Conn.; and Joseph Sterling, Secretary, Bridgeport Branch.

Many questions on plating and polishing problems were discussed. The answers in most cases seemed to be entirely satisfactory. The program presented was so successful that it should stimulate greatly increased interest in the local branch. Signs are evident that the membership of the branch will be added to as a direct result of the meeting.

To Mr. G. W. Spaler, manager of the Underwood Elliot Fisher laboratory, we extend our sincere appreciation for his cooperation in securing the lab for us and for his aid in other ways. To our own members, members of other branches and friends, we thank you too for your friendly spirit and good wishes as we endeavor to place Hartford Branch among the leaders.

BRIDGEPORT BRANCH

A round-table discussion was conducted by Mr. Clarence Helmle, the librarian, Dr. M. M. Beckwith of the J. B. Ford Co., Wyandotte, Mich., accompanied by our good friend from New Haven, Mr. John English of the same Company.

Dr. Beckwith, with his wide experience in the electroplating field, made the meeting very interesting as he spoke on the various problems presented. The Doctor told us that he never misses a meeting of the A.E.S. if there is one being held within reasonable distance while he is on business trips.

Most branches face the problem of how to increase the attendance at the meetings. This important subject was discussed at Bridgeport. Many suggestions were offered, but the one deemed most favorable was that the plant superintendent or other interested official should be made to realize the benefits of the A.E.S. to the employer as well as the employee. More cooperation on the part of the plant management would be a big help in solving the attendance problem!

We were pleased at the response of the officers at roll call. All but one were present.

WATERBURY BRANCH

Mr. Spencer Henn, Secretary of Waterbury Branch has gone into complete detail regarding the September meeting. President Candee and Librarian Earl Couch have an interesting and educational program planned for the fall and winter.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTROPLATERS' SOCIETY

Waterbury Branch held the first meeting of the fall season September 13 in the Colonial Room at the Hotel Elton. The meeting was called to order at 8:00 p. m. by President Ellsworth Candee.

The Society is now stressing the employment service which has been available for a number of years. Manufacturers who have positions open and members who desire positions should communicate with the branch secretary. This information will be placed with the Executive Secretary so he may make it available. Space will be provided in the REVIEW for advertising.

It is planned to continue the 6:30 p. m. dinner which met with approval last year. So that we may have an idea of the expected attendance at the dinner, return-addressed cards will be included with the notices. It is hoped that each member will make a special effort to return these cards indicating whether or not he plans to be at the meeting. As an added inducement, one card will be drawn from the lot returned, providing a free dinner for its owner.

Business meetings will continue to be held in between the regular meetings at the homes of the various officers, and the next such meeting will be held September 27 at the home of Ellsworth Candee in Watertown. Members are urged to attend these meetings as it leaves the regular meeting free for the educational program.

As first vice-president of the Supreme Society, Ellsworth Candee has been appointed Chairman of the Membership Committee and of course he is most anxious to have the Waterbury branch have a good showing this year. The Membership Committee of our branch is headed by Dick Crane and includes A. B. Crane, Tennant Elwin, W. L. Cassell, and E. R. Konopaske.

Our Executive Secretary, Bill Kennedy, told us of the efforts being made to form an Indianapolis Branch. There are 25 prospective members and it has been recommended that a temporary charter be granted.

We were most fortunate in being able to have Mr. Ralph S. Munger tell us of his experiences in France as an ambulance driver. This subject though far removed from plating was of intense interest to all of us as it gave us a picture of what happened in France during the German drive, a picture that we could not glean from the newspapers.

Mr. Munger sailed for France on March 23 with the first section of the American Ambulance Field Service. On reaching Paris he was surprised to see the lack of concern on the part of the people.

During this time the unit was waiting for their ambulances to be assembled, but there seemed to be a decided lack of mechanics and nothing was done until the war began in earnest on May 10. On May 13 twenty ambulances were delivered and the unit started immediately to the front without the elaborate ceremonies planned. Hitler had brought the front into France and the next few weeks were a nightmare of dodging bombs, shells, and burning buildings while moving the wounded from front line hospitals to the rear. The French soldiers were a picture of terror and discouragement as they con-

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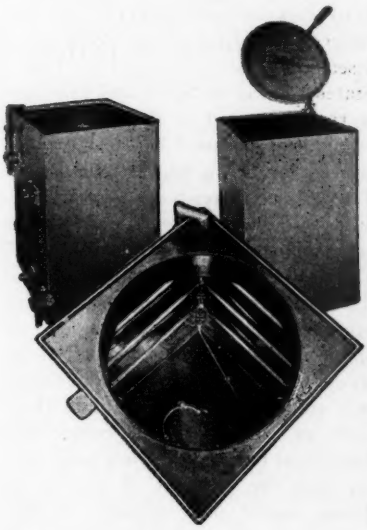

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stantly retreated from the terrific and perpetual German bombardment. The Allied air force did their best. Time and again one English or French plane could be seen attacking a dozen or more German bombers. Their work was effective but they were hopelessly outnumbered.

After the armistice it was a question as to what the unit should do next. The American Ambassador at Bordeau advised them to return to the United States by way of Spain and Portugal, so the entire unit of 36 men (4 of the original 40 captured by the Germans) started for Spain in the ambulances. They passed through the German lines without having to get out of the cars and reached the Spanish border at 9 o'clock at night. While they waited at the border they saw thousands of well equipped German soldiers passing into Spain. The ambulances were left at the border and they continued on to Bilboa only to find they must remain there until an American boat could take them from Portugal. Funds were very low and the prospect of staying in Bilboa looked dark indeed. Fortunately the International Telephone and Telegraph Company heard of their difficulty and loaned money enough to take them to New York. The wait in Bilboa was seven days; the trip to Lisbon on a special train which crawled along took 29 hours. The sight of an American ship waiting for them in the harbor was very welcome.

Enthusiastic comments on Mr. Munger's talk were heard during the rest of the evening although the numerous harrowing details did not seem to spoil the desire for refreshments which were served after the meeting adjourned.

SPENSER L. HENN, *Secy.-Treas.*

Cincinnati Branch held its first annual basket picnic at Martz Grove, Ross, Ky., September 15. The arrangements for this affair were made by the entertainment committee, composed of H. E. Nice, Edwin Fait, and Harry Misner. The majority of the thirty-five persons present arrived about noon and they were led to the picnic tables by Tom Whitehead, the man with the biggest appetite in the Cincinnati Branch.

After luncheon and a short rest was had, the games and contests were begun. Horseshoes and volley ball were played continuously throughout the afternoon. Bob Knoepfler was the most consistent winner at horseshoes. The Foreman, Bode, Knoepfler and Gannon families took the majority of the prizes for the other games home with them. The tired and dusty group left the picnic grounds at about sundown.

MARTIN GANNON, JR., *Secy.*

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Offices and Agencies in Principal Cities

Cincinnati Branch met at the Hotel Metropole, September 26, at 8:00 P. M.

The research committee of the branch announced that "The Cathodic Activation of metals and their alloys" would be the subject upon which they would work. This subject was taken in an attempt to make it easier to plate the various types of metals with which the plater comes in contact. They also stated that they had taken steps to obtain the different kinds of steel to be used in this work.

The membership chairman, Mr. Towner, said that the trophy for the largest percentage of membership increase in the A.E.S. appeals to him, and he asked for help in trying to bring this trophy to the Cincinnati Branch. We warn other branches that when he makes that kind of a statement that they will have to hustle to beat the Cincinnati Branch.

The speaker of the evening was Mr. R. M. Shields, of The Duriron Company of Dayton, Ohio, whose subject was "Plating Equipment." Mr. Shield's talk was illustrated in part by slides showing the manufacture and application of the several kinds of alloys made by the Duriron Company. Mr. Shields gave the branch a worthwhile evening, which was evidenced by the number of questions asked. Any branch securing Mr. Shields for the evening will well be rewarded.

We had a visitor, Mr. Ralph of the New York Branch. We enjoyed his remarks about platers as well as his presence.

MARTIN GANNON, JR., *Secy.*

Detroit Branch. The following questions were answered at the meeting in Detroit, September 6:

Q. What effect does temperature have on the pH value of a nickel plating solution? For example, at room temperature and at boiling?

A. Since pH is defined as the logarithm of the reciprocal of the hydrogen ion activity, and since an increase in temperature increases the hydrogen ion activity, one would expect the pH to decrease with increasing temperature. Experience shows this to be the case. Because of the effect of temperature on pH standards and indicators, the true extent of the change may not be shown. A rough calculation shows that the pH may actually be expected to change on the order of 1.5 pH between 20° and 100°C.

Q. What is the value of electrolytic polishing and to what extent can it replace or reduce regular polishing?

A. It was brought out that the chief application at the present time for electrolytic polishing is for the brightening and smoothening of wire goods. Such material, of course, is extremely difficult to polish by the conventional methods. Small surface defects are eliminated or greatly minimized and larger defects are minimized to a certain extent. The development of this process is in its early stages and it is not yet possible to say with any degree of certainty to what extent it may elimi-

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nate the conventional polishing operations.

Q. What is the mechanism governing the pH rise of a nickel plating solution during operation? Does it mean that the metal is "plating in" faster than "plating out"?

A. If the anode and cathode efficiencies were both 100%, there would be no pH change in the body of the solution. If the cathode efficiency is greater than the anode efficiency, more hydroxyl ions are being discharged at the anode than there are hydrogen ions being discharged and liberated at the cathode. This condition will cause a deficiency of hydroxyl ions in the solution and an excess of hydrogen ions which will cause the pH to become lower.

If the anode efficiency is greater than the cathode efficiency, the opposite will take place and the pH of the solution will rise. This is what actually happens when the pH rises in the nickel plating solution. The anode efficiency is greater than the cathode efficiency which means that more nickel is entering the solution from the anodes than is being deposited on the cathodes.

Q. Can aluminum be cadmium plated?

A. None of the members present has been able to successfully cadmium plate aluminum. Very recently, however, the librarian has seen some cadmium deposits on aluminum which apparently are very satisfactory. The aluminum was prepared for cadmium plating by a proprietary process, the name of which may be obtained by consulting the librarian.

R. B. SALTONSTALL, *Librarian*

Los Angeles Branch. The September eleventh meeting was called to order by President Don Bedwell.

A letter from President Fulforth of the Supreme Society was read. A letter from Mr. W. J. R. Kennedy, executive secretary, in regard to employment service offered to the members according to Article IV, Section 12, Page 11, of the Constitution, was read. A motion was made and carried that the secretary write to all of our members reminding them of this service and instructing them to communicate either with the president or the secretary if they were out of employment or if they have a position open.

An announcement was made that a platers' chemistry class would be held again this term at Polytechnic Evening High School. Miss Shelly will again instruct the class. Those desiring to attend were told to register and make a deposit of $1.00 at the business office of the school, class to be held in Room 341 of the Science Building.

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It was announced that the secretary had copies of the 1940 edition of the Platers' Guidebook on hand for those members who desired them.

The Picnic Committee reported attendance of over one hundred at our picnic, held July 28, in Recreation Park, Long Beach. The members expressed complete satisfaction with arrangements of the picnic and appreciation of the committee's efforts. It was suggested however that next time the social chairman have a little less, and the rest of the members a little more--soda-pop.

Alfred Pritchard asked that the secretary arrange to have him transferred from Rochester to Los Angeles Branch.

A number of visitors, who we hope are prospective members, were present and were introduced. Mr. Bob Schwigley of the Norton Company was present and gave a brief talk on the importance of closer cooperation between the polishing and plating departments.

The meeting was then turned over to the librarian for the Question Box period. The following questions were asked and an wered:

Q. A cyanide-zinc solution plates bright. What would be done to get a dead matte deposit?

A. Add ZnCN to reduce the free CN.

Q. Is the process of anodizing aluminum patented and if so is a license required?

A. The chromic acid process is not patented. The H_2SO_4 process is patented and a license is required.

Q. Is there any way to plate aluminum?

A. It can be plated by the Travers Process. The American Aluminum Company will send information on plating aluminum on request. It can be plated with Molyblack.

Q. Deposit from nickel solution is rough and sandy. How can this be remedied? Cold solution, pH 6.0 Ni 3 oz. per. gal.

A. Roughness is caused by floating impurities and can be eliminated by carbon filtration. Also try increasing amperage and decreasing time.

Announcement was made that the moving pictures made at the picnic would be shown at the next meeting.

E. R. HOLMAN, *Secy.*

Hartford Branch of the A.E.S. held its first fall meeting at the Elks Club in Bristol, Conn., September 16. The speaker for the evening was Ellsworth

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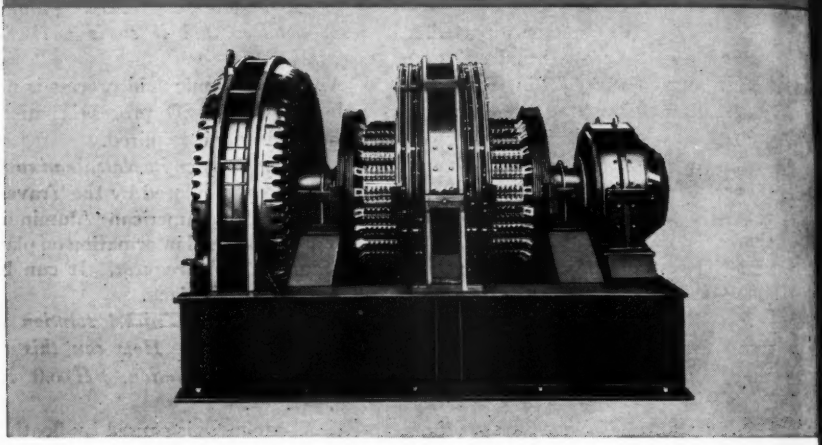

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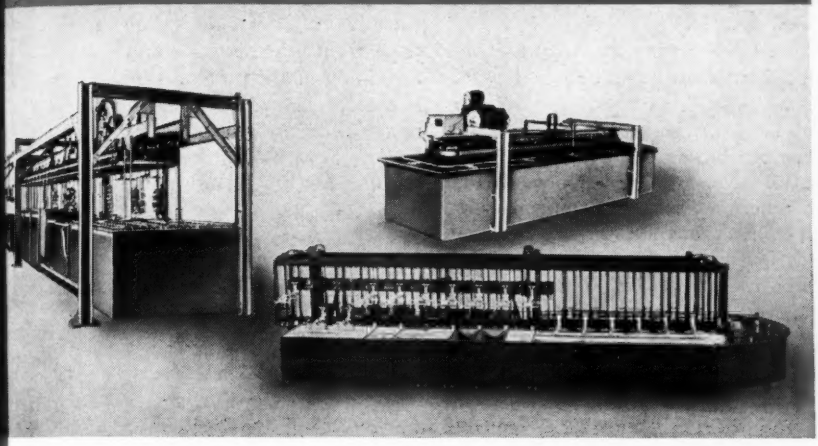

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Candee, first vice-president of the Supreme Society, and technical director of the American Metal Hose Branch of the American Brass Co., Waterbury, Conn.

Mr. Candee gave us a pep talk regarding new members and told us of the new A.E.S. membership campaign and trophy. He also presented the American Brass Company's brand new movie, "From Mine to Consumer." This picture certainly gave us a complete picture of the copper and copper alloy industry, from the mining of the ore to the final rolling and extruding operations of the finished product. Numerous compliments were heard regarding the merits of this picture.

After showing this picture, Mr. Candee devoted considerable time to further explain certain phases of the process. He also answered numerous questions regarding the electro-galvanizing of strip steel for the manufacture of metal hose.

APLEY N. AUSTIN, *Secy.*

Pittsburgh Branch held its regular meeting at the University Club on October 3. Following a very short business meeting, Mr. C. C. Conley of Dayton Branch, our Supreme Third Vice-President, was introduced as the speaker of the evening.

Mr. Conley gave a very interesting talk on solution control. He stressed the advantages of a clean shop and the financial return possible from orderliness in the plating room. Where room is at a premium, a tidy shop permits better distribution of equipment. Routine checkup on generators, solutions, etc., pay one of the largest dividends in the shop.

Close control not only includes temperature, and current control, but also pH, solution analysis, and solution life control. One of the latest controls is that of loss of dragout. The control of all of the above leads to the operation of an economical shop.

Following a short discussion, the balance of the meeting was turned over to Mr. Glenn Herring who showed moving pictures of a deep-sea fishing trip to New Zealand by Zane Grey.

FRANK R. KELLER, *Secy.*

Newark Branch held its regular meeting Friday evening, September 20, in the Club Room of the Hotel Douglas, Newark, N. J.

Mr. Horace Smith reported that our Annual Picnic was a success both so-

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cially and financially. That the attendance was 68 adults and 5 children and that four of the Supreme officers also attended.

He next reported that the Executive Board held a meeting and on examining the books found that 42 of the members had not yet paid their dues for the the present fiscal year. He explained to the members that dues are payable at the beginning of the fiscal year and may be paid annually, semi-annually or quarterly and that per capita tax had to be paid quarterly in advance, in order to remain in good standing with the Supreme Society. He urged the members to pay their dues at least by November 1st., stating that the $6.00 paid to the Society was little enough for what a member receives in return, from our Educational Sessions alone.

Our President read Article 6 — Sections 2 and 3 in our by-laws pertaining to suspension of members in arrears for dues for more than three months. The Secretary was instructed to notify all delinquent members of these proceedings.

Mr. Louis Donroe announced that the Educational Program was practically completed and that the booklet would probably be ready at our next meeting at which Mr. Nathaniel Hall will be our first guest speaker.

Mr. George Reuter conducted a question box in which numerous problems were discussed. Most of the questions were answered by one of our old timers, Mr. Royal F. Clark, Sr.

GEORGE WAGNER, *Secy.*

Providence-Attleboro Branch held its first meeting of the year at the Narragansett Hotel, September 16. The meeting was preceded by a dinner attended by many of the members. It seemed that there had accumulated a lot of questions and ideas during the summer, and it was with difficulty that President Wood finally broke up the lively discussion, late in the evening, to hold a business meeting. Plans for the coming year were laid, and a rough outline of the program for coming meetings was presented by Librarian Fred Allen. It was agreed that meetings would be equally divided between open meetings with prominent speakers, and discussion meetings. The former are usually held at the Rhode Island School of Design and draw many non-members, whereas the latter are commonly

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held at the Narragansett Hotel. It was voted unanimously to accept the generous offer of one of our members, Mr. Pierre Lonsbury, to hold a special meeting in November to inspect his new electroplating establishment.

ROBERT D. MACLACHLAN, *Secy.*

Lancaster Branch ushered in the 1940-41 season with a very fine educational program. Twenty-four members and guests were amply repaid for their time by the discourse on the subject "Electrolyte Films." Dr. A. Kenneth Graham was in his usual good form and very capably discussed the various types of resistances which are found in electrolytes and particularly pointed out the characteristics of the resistance films which are found in the immediate region of the anodes.

The various theories advanced by others in the research of the electrolyte films were presented and the procedures for studying these films were also discussed. It was quite apparent from these discussions that there are varying opinions and theories advanced regarding the concentration and characteristics of these films. However, Dr. Graham had little trouble in convincing his audience that these films were present and played a very definite part in the functioning of the plating solutions.

A rather lengthy discussion followed the lecture regarding the various factors presented in the paper, as well as various problems which the individual platers were experiencing.

Mr. Critchfield announced that it was decided at a recent meeting of the executive committee that we devote the entire meeting time to the educational program; all business to be transacted at special meetings which will be called periodically throughout the year.

The next meeting is scheduled for October 11 with a talk by Mr. Munning on the subject, "Color Buffing."

HARRY L. HOVIS, *Secy.*

Toledo Branch meeting was held on September 5, 1940, at the Macomber vocational high school for the purpose of planning the educational and social activities for the remainder of the fiscal year, to find ways and means to improve electrodepositions, and through mutual assistance among its members,

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to interest, and increase the knowledge of, those occupied in the numerous applications of electroplating.

After a lengthy discussion on research, the chair appointed the following members on a research committee: Messrs. Paul Dressel, Harry Moser, Philip Hale and David Williamson, Mr. Hale acting as chairman. They were instructed to select the subject matter to be studied, work out the necessary details to get the work started, and report their progress at the next meeting. A letter from the executive secretary's office, concerning an employment committee was read, and it was decided that, in order to give the matter full publicity, the letter should be read at several meetings.

Subjects receiving the highest vote, for discussion during the year were as follows: anode corrosion, bright Ni. copper plating, cleaning, chrome, electro-polishing, plate thickness, barrel finishing, and automatic polishing. The following committee was appointed by the chair, for the purpose of trying to get 100 percent attendance at the meeting, calling on several members each, either by phone or in person, to try and induce them to come to the meetings regularly, Messers Weiker, May, Moser, Miner, Vannorsdall. Dressel, the secretary was instructed to send a list of names of members they were to contact.

Mr. May was asked to visit the Grand Rapids branch to get some information as to the advisability of having a banquet in Toledo in December. It was decided to have six speakers throughout the year and three social meetings. At this time, plans were made to put on an extensive membership campaign headed by Mr. Shank and Mr. May. The possibility of the branch offering a course in electroplating, and electro-chemistry, to its members who might be interested was also discussed at this time. The educational chairman, Mr. May, announced that Mr. Penner would talk on the importance of anode corrosion at the October meeting.

The following questions were found in the question box:

Q. What experience has any one had with pH papers?

A. 1. Accurate enough for shop use. 2. Very expensive. 3. They are closer to electrometric method than the color method on the acid side.

Q. In cleaning copper plated parts, we used anodic cleaning and it turned the parts black and did not clean. Cathodic cleaning cleaned very well. What is the basic difference between the two?

A. Anodic cleaning releases oxygen on the work which may oxidize; cathodic cleaning releases hydrogen on the work in double the volume and does not oxidize.

Q. What is the difference in brittleness between bright Ni. deposit, and a deposit from the watts sol?

A. The hardness is controlled by the crystal size, all bright Ni. deposits are

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of smaller crystal size, and to that extent more brittle.

Q. How can you properly control carbonates in Rochelle copper?

A. Add tartaric acid crystals in small amounts.

Q. What is meant by "activated" as used with carbon?

A. Carbon prepared to possess high absorption porperties.

Q. How can you control the color of a brass sol.? Color derived should be approximately that of yellow gold. Color we get is either too yellow or shows faint copper shade around the edges.

A. Controlled free Cn. temp. amp. will regulate the amount of Cu. and Zn. in deposit thereby controlling the color. Use 1 percent of Pb. as free agent. Lead content of anodes affects color.

GASTON BERGEMAN, *Secy.*

Philadelphia Branch. The first meeting of the fall and winter of this year was well attended with all the officers and about fifty members present.

President Harry Keller expressed his disappointment in Philadelphia Branch for the loss of so many members. He pointed out how seriously the losses affected the Branch and that Philadelphia Branch is going backwards. A motion from the floor was passed that an immediate drive be started to bring in new members to offset our losses. He then appointed Mr. A. Robson chairman of our membership committee for Philadelphia Branch.

Supreme President Fulforth spoke to us on membership, exhibits for conventions and papers for publication in the REVIEW.

The banquet committee reported that big plans are being made for our yearly meeting to be held at The Broadwood Hotel, Saturday, November 23, 1940. Dr. Sanigar, chairman of the educational session promised us a very interesting meeting, with only the best speakers presenting up-to-the minute topics.

The motion was carried that Philadelphia Branch omit the November business meeting but moves December meeting up to December 6, 1940. We will resume our regular monthly meetings the fourth Friday of the month as usual after the first of the year.

Librarian Zurbach introduced the speaker of the evening, Dr. Sanigar. The subject, "Within the Atom," was a follow-up of the paper presented to the branch by Dr. Sanigar in April on, "A trip to the Atom."

Dr. Sanigar was given a rising vote of thanks. The meeting adjourned until Friday, October 25.

JOHN W. HIMES, *Secy.-Treas.*

Toronto Branch held its regular meeting at the King Edward Hotel, October 4. President A. Smith was in the chair and opened the meeting with a good attendance and introduced Mr. S. W. Burgess of the Proctor & Gamble Company as guest speaker of the evening. Secretary Allen Byers produced letters from Mrs. W. Lash-Miller, Mr. David Ayers, John C. Bogle, Mr.

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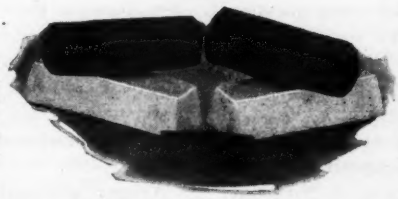

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Medina and Dr. Walter Meyer. Mr. Smith spoke on the opening of the platers' class at the Central Tech and stated that a quite a number of the members had joined up and he expected more before the first session.

Our Chairman called on Mr. Burgess to give his talk on "Wetting Agents and their Uses." The speaker started with the commercial cleaning of fabrics and finished in the plating room, stating that the wetting agent was still in the experimental stage, that it caused no reaction in alkaline or acid solutions, that it eliminated hydrogen bubbles, reduced surface tension and its action was entirely on the water present, that one pound was sufficient for 100 gals. of still Ni Sol., that is was only used up in the drag out, disperses dirt in cleaning Sol., that dirt will not stick to the work and has no effect on current (a great aid to burnishing small parts) and that lime soap will not stick to new balls, does not alter the pH., acts as catalist or dispersing agent. Mr. Burgess answered many questions and received a hearty vote of thanks with an invitation from president Smith to come again.

J. S. CAIRNS, *Rec. Cor.*

Baltimore-Washington Branch held its first fall meeting on Saturday, October 5, at 7:30 p. m. at the National Bureau of Standards, Washington, D. C. Mr. Irwin H. Hahn, our new president, occupied the chair. After the transaction of routine business, Mr. Bethke reported on the branch picnic held last July. Messrs. Beetham and Warnock were appointed as Membership Committee. Messrs. Turner, Slattery, and Brenner were designated as the Committee to make arrangements for the annual meeting and banquet.

Arrangements for our regular meetings, and attendance at these meetings, were discussed. With an average of 50% or better of our members attending, it was felt that the best means of improvement lay in hearty cooperation with Mr. Candee's campaign to enlist new members.

Our librarian, Dr. Brenner, presented Dr. Blum who briefly summarized the principal papers given at the Dayton Convention. A fine movie, with sound, entitled, "Nickel High-lights," was shown through the courtesy of International Nickel Company, Inc. Refreshments and gossip concluded the meeting.

C. T. THOMAS, *Secy.*

Boston Branch met Thursday, Oct. 3, at the Statler hotel with President Jones in the chair.

One application was read and turned over to the board of managers for approval, and one read and elected to active membership, Malcolm E. Porter, Lobl Manufacturing Co., Middleboro, Mass.

A report was made on the coming convention by A. W. Garrett. Joe Barron not being able to attend, the different committees are working hard and by the time the convention gets here everything will go off like clockwork. Boston branch is behind the committee 100 percent. The report was accepted

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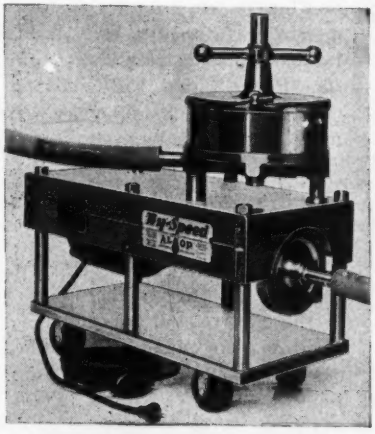

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as one of of progress. Bert Sage is back again so that we will have his support at the convention.

A motion was made that the next meeting be an open one so that those who are not members will have a chance to see what the society can do for them.

Motion was made that we have an entertainment committee. Arthur Mintie and Joe Barron will plan for the future meetings. A collation will be served at the next meeting.

The transfer of Dr. Wilson of Bridgeport branch was accepted.

A. W. GARRETT, *Secy.*

Grand Rapids Branch held its regular meeting September 12, at the Rowe Hotel. Arthur J. Slack, Frank King, and Kenneth Hampel were elected members. We had a large number of visitors and average attendance of members. Roll call of members was requested and visitors voiced their names and factory represented.

Mr. Earl Stadell of McGean Chemical company, gave us interesting information on bright nickel and copper.

Questions pertaining to bright nickel and anodes were read, and answers given by Mr. Stadell and our librarian, Stewart Martin.

C. E. ABEL, *Secy.-Treas.*

Springfield Branch held its regular monthly meeting at the Hotel Charles on September 23 at 8:00 P. M.

The meeting was called to order by President Costigan. The minutes of the previous meeting were read and approved. A letter from Mr. Kennedy, Executive secretary of the Society, was read announcing a new service to unemployed members of the society. The letter was further explained by Mr. Kennedy. At the request of Mr. Candee, 1st vice-president of the National Society, a chairman of the membership committee was elected. Mr. Costigan will fill the position.

President Costigan read a letter from the Librarian of the Hartford Branch inviting us to attend their October meeting. The meeting will be run similar to the radio program, "Information Please," and will include a trip through the laboratories of the Remington Rand Company. President Costigan urged all members planning to attend to get in touch with him. He will arrange for transportation.

Mr. Gordon Crapser of Universal Tool Company, Springfield, Massachusetts, was elected associate member of the Society and the following applications for associate membership read and recorded: Messrs. Ralph E. Fales, Chester J. Klimek, Frank M. Mathson, William Hanford and Norman Plank of Pittsfield, Mass., Edward Pietruza, Thompsonville, Conn., John Puppolo of North Adams, Mass., and William Robinson of Lanesboro, Mass.

President Costigan then introduced Mr. A. L. Shields, Engineer of the Westinghouse Electric & Manufacturing Company, Springfield, who presented an interesting talk on tin plating. Mr. Shields described the history, sources and uses of tin and traced the evolution of the tin plating solution from the sulphate solution to the modern stannate bath. He explained the purpose of the various ingredients and described the uses of electroplated tin. Mr. Shields stated that excellent results are being obtained in the stannate bath but stressed the importance of further research on the subject.

Mr. Shields' talk was well received as was evidenced by the numerous questions asked. He then was given a rising vote of thanks.

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MEMBERSHIP CAMPAIGN PROGRESS

The Membership Campaign has struck its stride and for the balance of the fiscal year there should be more members elected than there have been in the summer months.

Five months have gone by of the current fiscal year and to date the increase of the Supreme Society as a whole is 2.0%. This increase has come in spite of the fact that many branches have suspended members who are no longer active and the membership of the Society is now in an unusually active state. We certainly expect the membership will increase by leaps and bounds for the rest of the year.

We want to call to the attention of the various branches the current regulations concerning reinstatement of members. Anyone who desires to be reinstated may do so with the approval of the Board of Managers by the payment of one year's dues in arrears and the current year's dues. This permits the men to be reinstated without too much of a financial burden. Several branches have reinstated members who have been inactive for several years. Other branches have not been as successful because they were not aware of this ruling.

It has been suggested that the Supreme Society prepare and print a prospectus to be handed out to prospective members. We are working on this at present and would like to hear comments from ayone who has suggestions concerning this idea.

The return address cards which were sent to the various branches have started to come in and we hope that all branches will make the best possible use of these. The cards which have been received to date are being returned to the Branch Membership Chairman by the 15th of October.

"SHURFLOW" BUFFS ACCEPTED BY INDUSTRY

The performance of the new "Shurflow" Bias Type Buffs has been completely satisfactory, according to Mr. Ben P. Sax of the American Buff Corporation, Chicago. Reorders for this newly developed air-cooled buff have far exceeded previous expectations. The numerous plants that have been using the "Shurflow" buffs, during the past sixty days, report that they are especially pleased with the great degree of efficiency and economy accomplished in general high-speed buffing operations. A special feature of this precision-made buff is its regular cutting power. Its bias type construction prevents raveling and offers more resistance to wear.

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The Abstract Section

CHARLES C. CONLEY, *Chairman, Program and Educational Committee*

Effect of Glycerine on the Throwing Power of Plating Baths. By F. C. MATHERS and W. J. GUEST. *Trans. Electrochemical Society* **78,** (Preprint 6) (1940). The effect of glycerine on the throwing power of typical nickel, acid copper, and acid zinc baths was measured by the method of Haring and Blum. In quantities of 12.3 oz./gal. glycerine reduced the throwing power of nickel 2-8%, depending on the current density, which ranged from 7 to 50 amps./sq.ft. In acid copper, the throwing power was reduced at 27 amps./sq.ft. from 22% to 15%, and increased at 4.5 amps./sq.ft. from 42% to 54%. In acid zinc baths, the throwing power was raised from 3% to 11.8% at 4.5 amps./sq.ft., while at 27 amps./sq.ft., it was raised from 5.4% to only 7.9%. The quality of the deposit was not affected. The influence on the throwing power is ascribed to increased polarization due to increased viscosity of the solution, diminished by the increase ohmic resistance of the electrolyte.

ERNEST H. LYONS, JR.

The Electrogalvanizing of Wire. By ERNEST H. LYONS, JR. *Trans. Electrochemical Society* **78,** (Preprint 2) (1940). In discussing recent developments in electrogalvanizing round steel wire, it is suggested that the difficulty in cleaning is the result of decomposition of drawing compounds due to elevated temperatures and pressures during drawing. Traces of copper may lead to hydrogen occlusion and brittle coatings, and iron salts contaminate coatings with iron. In the Bethanizing process, the bath contains sufficient acid to permit high current densities, while in the Meaker Process the bath is nearly neutral, but contains addition agents for this purpose. Contact difficulties, the use of zinc anodes, etc., are discussed. Estimated cost figures are given. Compared to hot galvanized wire, electrogalvanized wire is expected to have a longer life due to greater uniformity of coating as well as to heavier coatings obtainable. Furthermore, the zinc coating is more ductile and adherent. Operating advantages and various tests for determining coating thickness are reviewed; the hydrochloric acid-antimony chloride strip test is recommended for general use.

ERNEST H. LYONS, JR.

Density Measurement. The Determination of the Density of Electroplating Baths. By A. WOGRINZ. *Metallwaren-Ind. Galvano-Tech.* **4,** 57-8 (1940). The weight of addition agent in a plating bath is determined by the formula $b = (D^1 - aM - D)/Z$, in which b is the weight of addition agent, D^1 is density of the bath tested, D is density of a bath of the pure compound in the same concentration, and M and Z are unit changes of D with concentration.

L. H. SEABRIGHT.
Chemical Abstracts **34,** 3185 (1940)

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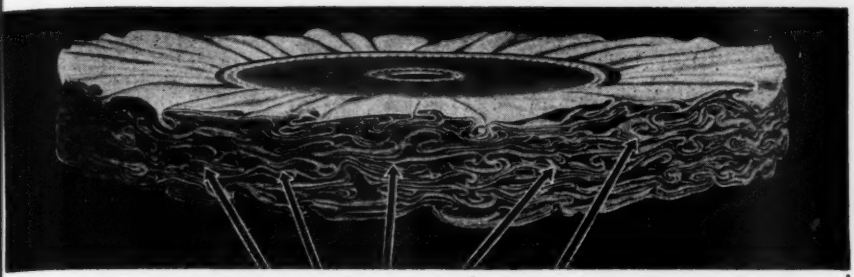
Periodic Electrolytic Depositions of the Alloy Zinc-Cadmium from Sulfate Baths. By P. F. MIKHALEV. *Compt. rend. acad. sci. U. S. R. S.* **24,** 899-903 (1939) (in English). With a copper cathode (6 sq.cm.) and a platinum anode (5 sq.cm.) in 150 cc. of solution (containing 340 g. of $ZnSO_4.7H_2O$, 16 g. $CdSO_{4.3/8}H_2O$ and 20 g. $Al_2(SO_4)_3.18H_2O$ per liter of solution), only cadmium is deposited as long as the applied voltage is not more than 2.6 and the current not less than 10.5 ma. (9.8 amps./sq.ft.); when the cadmium ion becomes depleted next the cathode, the voltage rises to 2.8 and the current decreases to 9.5 ma. and zinc is deposited. In the presence of 0.2-7 g./l. dextrin (interference with diffusion of cadmium ions to the cathode), the voltage fluctuates periodically between 2.8 and 2.6 with concomitant fluctuation of the current betweeen 9.5 and 10.5 ma., and zinc and cadmium are periodically deposited after the initial cadmium deposit. After deposition of zinc and cadmium for several hours or by stirring the solution, the voltage and current fluctuations vary somewhat from the above values. Coagulation of the dextrin causes periodic deposition of zinc and cadmium to cease. Caffein or cresolsulfonic acid may be used instead of dextrin to give periodic deposition of zinc and cadmium, but the fluctuation period is short. Analyses of the cathode deposits showed 20-35% of zinc for periodic depositions of zinc and cadmium in the presence of dextrin or caffein. Peptone or gelatin does not bring about periodic deposition of zinc and cadmium.

G. AYERS.
Chemical Abstracts **34,** 4343 (1940)

Effect of Gelatin on the Overvoltage of Cadmium and Lead. By S. F. BELETSKII, E. K. OVECHKIN and I. M. FRANTSEVICH. *Uchenye Zapiski Kharkiv Univ.* (Trudy Inst. Khem.) **4,** No. 13, 23-48 (1938); *Chimie & industrie* **43,** 216. Addition of gelatin to the bath modifies the degree of dispersion of cadmium and lead coatings. Generally, the form and nature of these coatings are governed by the bath temperature and by the nature and concentration of the addition agent. The most compact deposits of cadmium were obtained at 35° C. (95° F.) with a bath that was 0.5 *N* in $CdSO_4$ and 0.1 *N* in H_2SO_4, with or without 0.01% gelatin. At 25° C. (77° F.) addition of 0.001% gelatin produces the formation of spongy deposits. Addition of 0.001 mol./1. of *o*-cresol or *p*-toluidine favors the formation of dense, finely granular deposits.

A. PAPINEAU-COUTURE.
Chemical Abstracts **34,** 4343 (1940)

Some Tests of Anodic Bright Etching (Polishing) of Copper. By C. BENEDICKS and BO LJUNGGREN. *Arkiv Kemi, Mineral. Geol.* **13A,** No. 25, 19pp. (1940). Polished specimens of copper were etched electrolytically in a beaker of 50% H_3PO_4 using a c.d. of 0.11 to 1 amp./sq.dm. (1-9.3 amps./sq.ft.) and 2.5 to 6 v. for various lengths of time. A small brass plate was used as cathode. Although it was found easy to remove scratches from the surface of copper, it has not been possible to attain any really plane surface, with either a short or long treating time. The Cu_2O inclusions in the copper are easily dissolved, leaving pits. A possible explanation of the phenomenon of bright



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polishing is that on the surface of the anode is formed a thin liquid layer of poor conductivity, exerting a certain passivating influence. In this layer, protruding portions of the metal are less passivated and become consequently more attacked than the underlying portions. For this smoothing out, or polishing, homogeneity of composition, however, is a necessary prerequisite.

L. H. SEABRIGHT
Chemical Abstracts **34,** 4343 (1940).

The Effect of an Oxide Film upon the Formation of the Active Layer. By AKIRA MIYATA. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) **37,** 85-113 (1940) (in English); *Chemical Abstracts* **34,** 3991 (1940). A study of anodizing aluminum in oxalic acid, effect of c.d., sparking voltage, etc.

ERNEST H. LYONS, JR.

Tin-Plating. The Effect of Foreign Metallic Ions in the Electrolyte upon the Inner Structure of Electrolytic White Tin. By HIDEKI HIRATA, HAZIME KOTO and ETU SIMIZU. *Mem. Coll. Sci., Kyoto Imp. Univ.* **A22,** 209-23 (1939); *Chemical Abstracts* **34,** 3992 (1940). X-ray examination of tin electrodeposited from solutions containing a small quantity of ferrous, manganese, and cupric ions showed that Fe^{++} and Mn^{++} changes the direction of maximum growth, while Fe^{++} also changed the direction of the common axis of the microcrystals (fibrous structure). The copper appeared to deposit in colloidal particles interspersed in the tin crystals.

ERNEST H. LYONS, JR.

Electrolytic Etching of Platinum Metals and Alloys with Alternating Current. By E. RAUB and G. BUSS, *Z. Elektrochem.* **46,** 195-202 (1940). Samples of platinum, irridium, rhodium, palladium, platinum-irridium, platinum-rhodium, platinum-ruthenium, and platinum-osmium were electrolytically etched at room temperature by means of alternating current. Excellent results were obtained without the structural changes that may occur in hot-etching due to recrystallization. The c.d. varied from 0.05-0.2 amp./sq.cm. and the time from 3-88 min. As etchants, HCl, HCl + NaCl, KCN and concentrated H_2SO_4 were employed.

H. S. van KLOOSTER
Chemical Abstracts **34,** 4343 (1940).

Iron Plating. The Electrolytic Restoration of Iron Articles by means of Simple and Complex Chloride Electrolytes. By E. T. RICHARDS. *Metallwaren-Ind. Galvano-Tech.* **38,** 87 (1940) (in German). Worn machine parts and other iron articles can be electroplated to desired size. Originally, solutions for this purpose contained $FeSO_4$ and $MgSO_4$ in varying proportions. These gave porous and rough deposits. Recently developed solutions contain iron chloride, $FeCl_2$, from 300-1000 g./l. (40-138 oz./gal.) and about an equal quantity of calcium chloride, $CaCl_2$. The bath is operated at 70-100° C. (158-212° F.) depending on concentration, and 20 amp./sq.dm. (186 amp./sq.ft.). The solution should be a clear green. Plating is much more rapid than with the sulfate bath as a higher c.d. is used. The addition of potassium chloride and

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boric acid improves the characteristics of the deposit. Equilibrium concentration is maintained in the solution by regulating the acidity and the iron-anode area.

L. H. SEABRIGHT.
Chemical Abstracts **34,** 3992 (1940)

Chrome Plating Instead of Nickel Plating. By N. P. LAPIN. *Korroziya* **4**, No. 4, 306-8 (1938); *Khim. Referat. Zhur.* **2**, No. 4, 142-3 (1939); *Chemical Abstracts* **34**, 2260 (1940). A number of experiments were performed with chromium plating using an electrolyte containing HBF_4. The solution contained CrO_3 400 g., $Cr_2(SO_4)_3$ 3 g., Zn dust 18 g., 50% solution of HBF_4 2 cc., water, 1 liter. The solution was very stable at low current densities (9-28 amps./sq.ft.), a temperature of about 77° F., and with lead anodes. This cold chromium bath, with an addition of a protective liquid, makes possible chromium plating under conditions close to those of nickel plating.

W. R. HENN

Electrodeposition of Alloys, 1930 to 1940. By CHARLES L. FAUST. *Trans. Electrochemical Society*, **78** (Preprint 7) (1940). This very complete review of alloy plating in the last decade outlines material published in 235 references, which are cited, as well as a number of comments communicated privately by several workers in this field, and a series of excellent observations by the author, who is experienced in alloy plating. Alloys are more extensively depsoited than is commonly realized.

The conditions governing the commercial plating of alloys are: (1) chemical stability of the bath; (2) replacement of plated metals; (3) effect of other ions in the bath; (4) absence of undesired anode or cathode reactions; (5) anode purity; (6) feasibility of chemical control. The anode reactions, although as important as the cathode processes, have not been much studied, but discussion and several references are given.

As factors affecting the composition and character of the deposit, the electromotive series, pH, temperature, agitation, and effect of addition agents and impurities are discussed. Each alloy must be studied individually, for there are few general rules. However, with some exceptions, alloy deposits may be harder, denser, and brighter than plates of single metals. In certain composition ranges alloy deposits have shown greater corrosion resistance, more adherence, easier buffing, greater suitability for subsequent plating, or a wider plating range than one or both of the component metals.

Evidence is cited that alloy deposits are true alloys and not mere mechanical mixtures of the metals.

The greatest commercial deposition of alloys is done for decorative purposes. Many so-called "bright nickel" deposits are actually alloys plated under careful control. Besides the well-known cobalt-nickel, zinc, cadmium, selenium, and tellurium are used as alloying metals, and lead and tin have been suggested.

Commercial bright zinc often contains small amounts of molybdenum or nickel, and tungsten, chromium, uranium, and some other metals have been proposed.

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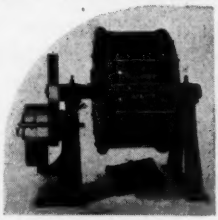

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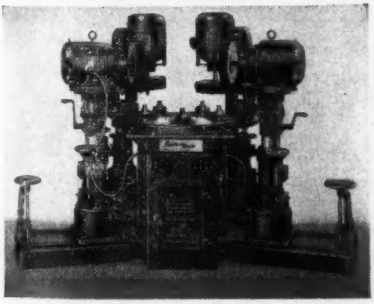

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Bright deposits of tin with copper, nickel, or silver, and of cadmium with silver, tin, or zinc, as well as lead-tin alloys, have been described.

Brass plating has been practised for nearly one hundred years and is extensively used. Baths are generally controlled for color rather than composition, and deposits may be buffed or colored. The results are determined by the copper-zinc ratio, free cyanide, free alkali, impurities, and other bath constitutents, temperature, current density, pH, and agitation. By adjusting the pH, uniform color can be obtained from a range of bath and plate compositions. The effect of ammonia and brighteners is outlined. "Bronze plating" is actually brass deposition controlled to give a bronze color although copper-tin bronze deposits can be plated. New types of brass and copper-zinc deposits are described, as well as brass plating from baths not containing cyanide.

"Black nickel" deposits are a nickel-zinc-sulfur alloy, and a molybdenum-nickel-oxygen deposit is used commercially for black coatings.

A great variety of shades of gold is electroplated by adding alloying elements: nickel, copper, silver, zinc, cadmium, tin, and palladium are mentioned. Some of the deposits contain four metals.

In the field of protective coatings, alloys of zinc with cadmium or mercury are reported to give better corrosion resistance than zinc or cadmium alone, especially in the salt spray. Some commercial use of these alloys has been made; and they deposit on castings where pure zinc will not plate from cyanide solutions.

Nickel-cobalt alloy plates are reported more corrosion resistant than pure nickel. A large number of alloy plates intended for corrosion protection are cited, such as tin-zinc, nickel-tin, lead-bismuth, and lead-thallium; but these do not appear to have been used commercially.

In an effort to find a tarnish resistant silver plate, alloys of silver with cadmium, chromium, indium, nickel, palladium, and lead have been deposited and studied. Copper, cobalt, iron, and nickel alloys with silver have also been plated. None of these has reached a commercial stage.

Tungsten has never been deposited in a pure state, but can be codeposited with iron or nickel, as well as a number of other metals. The alloys are not only resistant to atmospheric corrosion, but also withstand many acids and chemical reagents.

Alloys are not invariably superior in corrosion resistance.

Sometimes alloy coatings are obtained by depositing the metals separately, and then uisng a heat treatment to produce alloying. Such processes are described.

Brass plating is extensively carried out to ensure rubber adhesion to steel. Here close control of the plate composition is necessary. Brass is also deposited in the preparation of thermo-couples.

Electrodeposited silver alloys have been recommended as undercoats to improve adherence of plated coatings. Nickel-iron deposits have also been recommended for this purpose, as well as for their magnetic properties, and they have been used in building up worn parts. Copper-nickel and similar alloys have been deposited for special purposes.

Copper-graphite, lead-tin, silver-lead, cadmium-silver, and certain other alloys have been deposited to form bearings, and results of these processes are

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described. Electrodeposition appears to offer peculiar promise for bearing materials.

A large number of other electrodeposited alloys are mentioned which have been used in connection with scientific studies.

ERNEST H. LYONS, JR.

Electrolyte Films in Acid Copper Plating Baths. By HAROLD J. READ and A. KENNETH GRAHAM. *Transactions Electrochemical Society*, **78**, (Preprint 1) (1940). The composition of the "cathode film" in an acid copper bath was determined by analyzing samples withdrawn slowly through small holes drilled in the cathode. The film was richer in acid and poorer in copper than the main body of solution. The extent of the difference depended on the copper concentration, acidity, current density, and temperature. Results did not vary much horizontally over the cathode, but showed large differences between the bottom, middle, and top, although the solution was well stirred. Cf. *Proceedings of 27th Annual Convention, American Electroplaters' Society*, pp. 95-106 (1939).

ERNEST H. LYONS, JR.

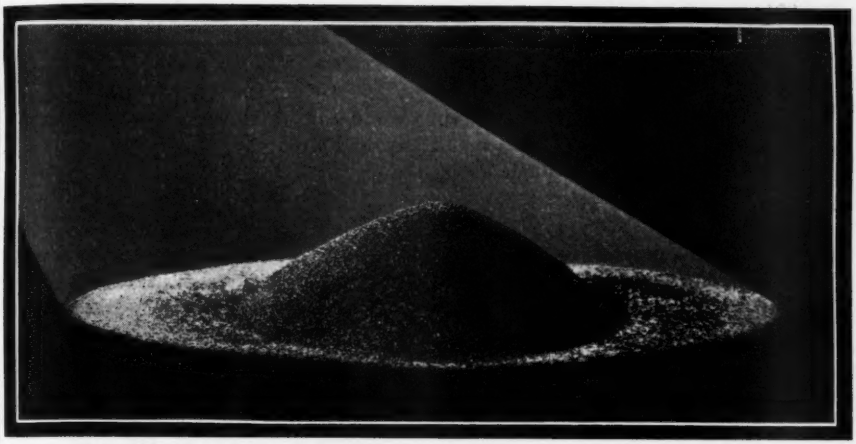
An Electrolytic Chromium Plate Thickness Tester. By STANLEY ANDERSON and R. W. MANUEL. *Trans. Electrochemical Society* **78,** (Preprint 3) (1940). A small brass cup with hole in the bottom is pressed down over a 3/16″ or 3/32″ hole in a piece of rubber lying on the chromium-plated specimen, and is filled with a solution of sodium sulfate, Na_2SO_4 (72 g./l., or 9.6 oz./gal.), and trisodium phosphate, $Na_3PO_4.12H_2O$ (127 g./l., 17 oz./gal.). The brass cup is connected as cathode and the specimen as anode, with a current of 35 milliamperes (9.75 milliamperes with the smaller hole). When the chromium has been penetrated there is a marked change in the current which is observed by a milliammeter in the circuit. The number of seconds from the start of the current to the needle deflection at the penetration of the chromium is observed with a stop watch, and is equal to the thickness of the chromium in millionths of an inch. Full instructions for the construction, standardization, and operation of the instrument are given, with a discussion of the factors involved in its accuracy. An accuracy of $\pm 5\%$ is obtained, and can be improved under special conditions.

ERNEST H. LYONS, JR.

The Electrodeposition of Tungsten. By A. GLAZUNOV and V. JOLKIN. *Atti X° congr. intern. chim.* **4,** 353-9 (1939) (in German); *Chemical Abstracts* **34,** 3184 (1940). Metallic tungsten is deposited on copper from a solution containing 1500-1700 g./l. K_2CO_3 and 120 g./l. WO_3 at 115° C. Below 80° C. and a c.d. of 1500 amps./sq.m. only black oxides are obtained. After one-half hour, plating stops and the deposit begins to redissolve by reacting with accumulated higher-valent tungsten ions.

ERNEST H. LYONS, JR.

Influence of Surface-Active Substances and Colloids on the Overvoltage of Cadmium and Lead. By S. F. BILETSKII, E. V. OVECHKIN



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and I. M. FRANTSEVICH. *Trans. Inst. Chem. Kharkov Univ.* **4,** No. 13, 24-48 (1938); *Chemical Abstracts* **34,** 3185 (1940). Overvoltages were measured in the electrolysis of acid cadmium sulfate and lead acetate solutions using low c.d. and small additions of gelatin, *o*-cresol, and *p*-toluidine as addition agents giving dense, finely crystalline deposits.

ERNSET H. LYONS, JR.

Electrolytic Descaling. By H. PRELINGER. *Korrosion u. Metallschutz* **15,** 374-80 (1939). A review of the general principles and technical features of cathodic descaling methods, especially the Bullard-Dunn and the Tainton processes. The anodic descaling of alloy steels and the removal of chromium oxide by preliminary oxidation to higher oxides and subsequent solution in H_2SO_4 (also with simultaneous cathodic treatment) are briefly discussed.

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Chemical Abstracts **34,** 3185 (1940).

The Application of the Method of Electrolytic Polishing to Ferrous Metals. By E. HUGONY. *Atti X° congr. intern. chim.* **4,** 360-70 (1939); *Chemical Abstracts* **34,** 3186 (1940). Anodic treatment in phosphoric acid of mechanically polished electrolytic copper removes the parallel microscopic ridges and makes the surface shiny, but shows the outline of the granules. The best conditions are 1.7 v., c.d. 8.7 amp./sq.dm. (81 amps./sq.ft.) for 15 minutes, followed by 2.4 v., c.d. 12 amp./sq.dm. (112 amps./sq.ft.) for 2 minutes. Attempts to electropolish electrolytic iron, 24% nickel steel, and 22% nickel, 23% chromium stainless steel, in acetic, orthophosphoric, perchloric, and oxalic acids and mixtures of these acids in various concentrations were unsuccessful.

ERNEST H. LYONS, JR.

Anodic Deposition of Oleoresinous Lacquers. By C. G. SUMNER. *Trans. Faraday Soc.* **36,** 272-8 (1940); *Chemical Abstracts* **34,** 3188 (1940). Metal can be lacquered by electrodeposition from an emulsion of an oleoresinous lacquer in an alkaline solution; the lacquer deposits at the anode by coagulation. Coatings from sodium aluminate solution contain alumina also. The film weight depends generally on the quantity of electricity passed. The method is suggested to apply lacquer in tin cans after fabricating.

ERNEST H. LYONS, JR.

The Electrolytic Preparation of Copper-Zinc-Nickel Alloy. By N. A. IZGARYSHEV and KH. M. RAVIKIOVICH. *J. Gen. Chem.* (U.S.S.R.) **9,** 1443-55 (1939); *Chemical Abstracts* **34,** 2714 (1940). By the addition of cresolsulfonic acid or gum arabic, copper-zinc, copper-nickel, nickel-zinc, and copper-zinc-nickel alloys were deposited from sulfate solutions in the presence of 1% boric acid. The copper-nickel-zinc alloy was fine-grained. Polarization curves are given.

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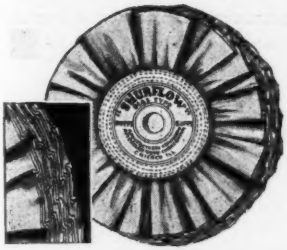

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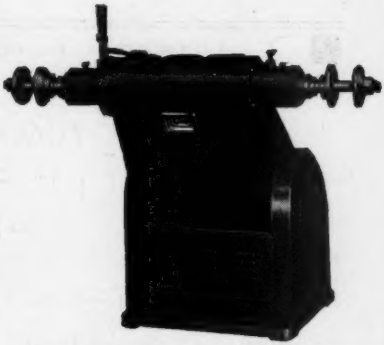

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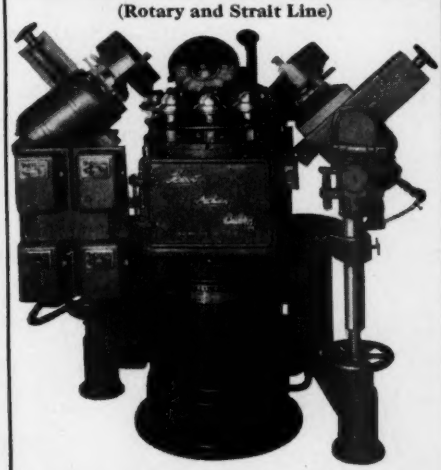

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